

SHARP

Electronic Components
January 2008

For Your Creative Products

ELECTRONIC COMPONENTS



<http://sharp-world.com/products/device/>

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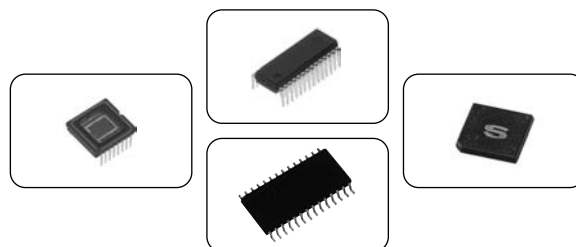
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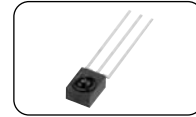
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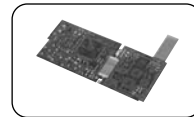


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Advanced Measures for Environmental Conservation

In accordance with environmental guidelines established under Sharp's Basic Environmental Philosophy, the Sharp Group Charter of Corporate Behavior, and the Sharp Code of Conduct, Sharp is pursuing environmental conservation in all aspects of its business activities. Since fiscal 2004, when the medium-term brand objective of becoming an environmentally advanced company was first set, Sharp has been promoting the Super Green Strategy to achieve its corporate vision and to establish sustainable manufacturing systems.

● Basic Environmental Philosophy ●

Creating an Environmentally Conscious Company with Sincerity and Creativity

● The Sharp Group Charter of Corporate Behavior ●

Contribution to Conservation of the Global Environment

The Sharp Group will fulfill our responsibility for environmental conservation by promoting the creation of proprietary technologies that contribute to protection of the global environment, and by carrying out our product development and business activities in an environmentally conscious manner.

● The Sharp Code of Conduct ●

Contribution to Conservation of the Global Environment

1. To Conserve the Environment:

- ① We will comply with all applicable environmental laws, regulations and territorial agreements, and work to practice efficient use and conservation of resources and energy voluntarily, in the recognition that environmental conservation is an essential facet of corporate and individual pursuits.
- ② We will ensure proper use and control of chemical substances in our business activities including research, development and manufacturing, meeting or exceeding levels determined by laws and regulations.
- ③ We will engage in the active acquisition, reporting and promotion of environmental information at an international level, as the Sharp Group companies promote communication with shareholders and local residents.
- ④ We understand the importance of internal company systems and related details in acquiring third-party certification and recertification of our ISO environmental management systems, and we will conduct our business operations in accordance with relevant internal guidelines.

2. To Develop Environmentally Conscious Products and Services, and Conduct Our Business Operations in an Environmentally Conscious Manner:

- ① We will engage positively in the minimization of resource use, reduction in the size and weight of products, use of recycled materials, and the development of long-lasting, energy-saving, energy-creating products.
- ② We will work to compile information related to harmful substances that might damage the environment or human health, and will not, as a matter of principle, make use of these harmful substances in our products, services and business activities.
- ③ We will use recyclable materials wherever possible, with product development focused as a matter of policy on structures that are detachable or capable of dismantling, and suited to recycling.
- ④ We will work aggressively to reduce greenhouse gas emissions in the full range of our business activities, in order to contribute to the prevention of global warming.
- ⑤ We will work to conduct our business in such a way to select and purchase materials that are harmless to the global environment, and to local residents and employees, for the resources needed for business activities (equipment, raw materials, subsidiary materials, tools, etc.).
- ⑥ We realize that waste material is a valuable resource, and we will actively conduct our business operations in such a way as to maximize the 3Rs (reduce, recycle and reuse) and will contribute to minimizing the amount of waste sent for permanent landfill disposal.

* The Sharp Group Charter of Corporate Behavior and the Sharp Code of Conduct were instituted in May 2005 as a revised edition of the preceding Sharp Charter of Conduct (instituted in 2003). The section above is an excerpt from descriptions of Sharp's environmental conservation efforts. For more information: <http://sharp-world.com/corporate/eco/report/index.html>

as Management Policy

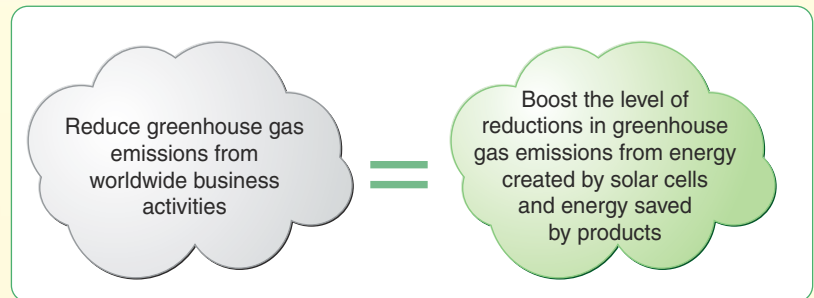
Corporate Vision: Sharp's Energy-Creating and Energy-Saving Products Equalize Sharp's Greenhouse Gas Emissions

Sharp will limit to the greatest extent possible the amount of the greenhouse gas emissions resulting from its business activities around the world, while at the same time, significantly help reduce greenhouse gas emissions based on the energy-creating effects of solar cells and the energy-saving effects of products. The idea is for the amount of greenhouse gas emissions reduced to exceed the amount emitted by fiscal 2010.

Sharp's greenhouse gas emissions in fiscal 2006 were approximately 1.73 million t-CO₂. At the same time, it is estimated that the solar cells Sharp produced over the 20 years up to fiscal 2005 generated approximately 1,322 GWh^{*1} in fiscal 2006. This is equivalent to a reduction in greenhouse gas emissions of approximately 0.56 million t-CO₂.^{*2}

*1 Calculation based on 1,272 MW, Sharp's total solar cell production over 20 years from 1986 to 2005.

*2 Calculated using a CO₂ emission unit of 0.425 kg/kWh (fiscal 2005) at the receiving end, announced by the Federation of Electric Power Companies of Japan.

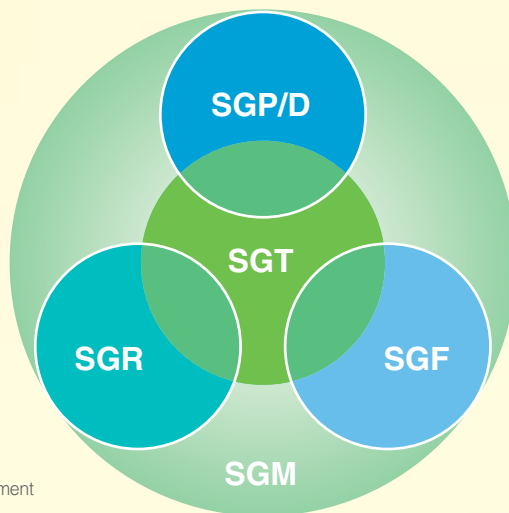


"Super Green Strategies" to Become an Environmentally Advanced Company

SGT
Super Green Technologies
 Developing unique environmental technologies that contribute to environmental conservation

SGR
Super Green Recycling
 Recycling used products to promote resource recycling

SGM
Super Green Management
 Enhancing environmental sustainability management



SGP/D
Super Green Products and Devices
 Creating products and devices with high environmental performance

SGF
Super Green Factories
 Factories with high environmental consciousness and trust from communities

Becoming an Environmentally Advanced Company

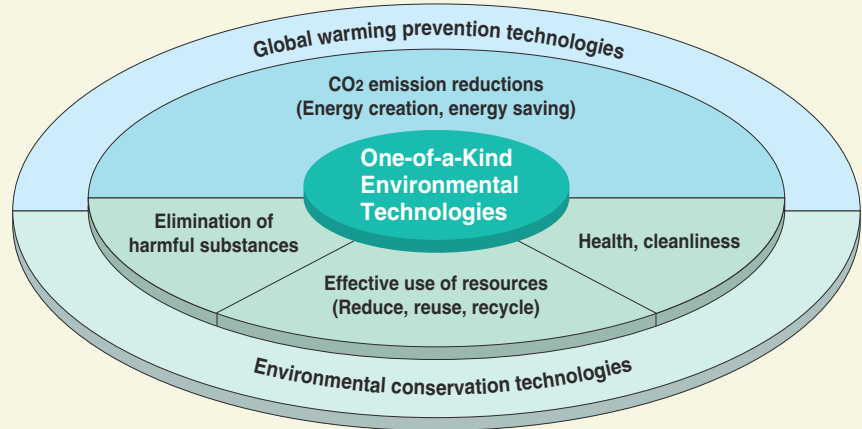
Developing Super Green Technologies

To achieve the corporate vision of “Sharp’s energy-creating and energy-saving products equalize Sharp’s greenhouse gas emissions,” the development of superior environmental technologies is an essential factor in the environmental performance of products and devices and the reduction of environmental impact during production.

Sharp conducts research and development in four areas of environmental technology: reduction of CO₂ emissions, effective use of resources, elimination of use of harmful substances, and promotion of health and cleanliness.

Sharp recognizes the most important technologies in these areas as one-of-a-kind environmental technologies—key technologies for achieving global environmental conservation—and develops them under a company-wide development strategy. These technologies enhance environmental performance of products and devices, reduce environmental impact at plants, and facilitate recycling. Unique technologies, evolving from these developments, are what Sharp calls Super Green Technologies.

■ One-of-a-Kind environmental technological development fields that give birth to Super Green Technologies



Development of Green Devices and Super Green Devices

Sharp calls its environmentally conscious devices “Green Devices.” To define criteria for development and design based on seven concepts such as low energy consumption and recyclability, Sharp established the Green Device Guidelines, which it began applying in fiscal 2004. In fiscal 2005, Sharp began certifying Green Devices that attain the highest possible levels of environmental performance as “Super Green Devices.”

The development of Green Devices begins at the planning and designing stage, where every aspect of the product’s environmental impact is discussed. Sharp then sets specific objectives based on the Green Device Standard Sheet. Finally, in the trial manufacture and mass production stages, Sharp determines how well the actual product has met its objectives.

In fiscal 2006, both Green Devices and Super Green Devices exceeded their sales ratio targets. In the coming years, Sharp plans to raise these figures even higher.

* Certification criteria for Green Devices and Super Green Devices in fiscal 2006: Green Devices had to satisfy at least 90% or more of all 20 assessment items (9 of which are compulsory) listed in the Environmental Performance Criteria. Super Green Devices will have to satisfy at least 95% or more of the 20 assessment items (10 of which are compulsory) listed in the Environmental Performance Criteria. At the same time, they must be either the industry’s No. 1, or the industry’s first devices in at least one item of the External Environmental Claim Standards.

■ The Green Device concept

Energy saving	Reduce total power consumption and reduce power consumed in standby mode compared to previous models
Recyclability	Use standard plastic or materials that are easy to separate and disassemble (target: LCD devices)
Resource saving	Reduce weight or volume compared to previous models
Green material	Control usage of chemical substances contained in parts and materials and use no substances prohibited under Sharp standards
Long life	Extend the life of the product with exchangeable parts and consumables (target: LCD devices)
Packaging	Reduce packaging materials
Information disclosure	Provide information on chemical substances

—Super Green Technologies, Devices and Factories

Achievement of a Super Green Factory

Sharp is systematically acting to enhance the environmental consciousness of its production sites worldwide. Sharp has established proprietary assessment standards to rank factories with high environmental consciousness as Green Factories, and those with extremely high environmental consciousness as Super Green Factories. Sharp is planning to convert all its production sites around the world into Green Factories or higher by the end of fiscal 2007.

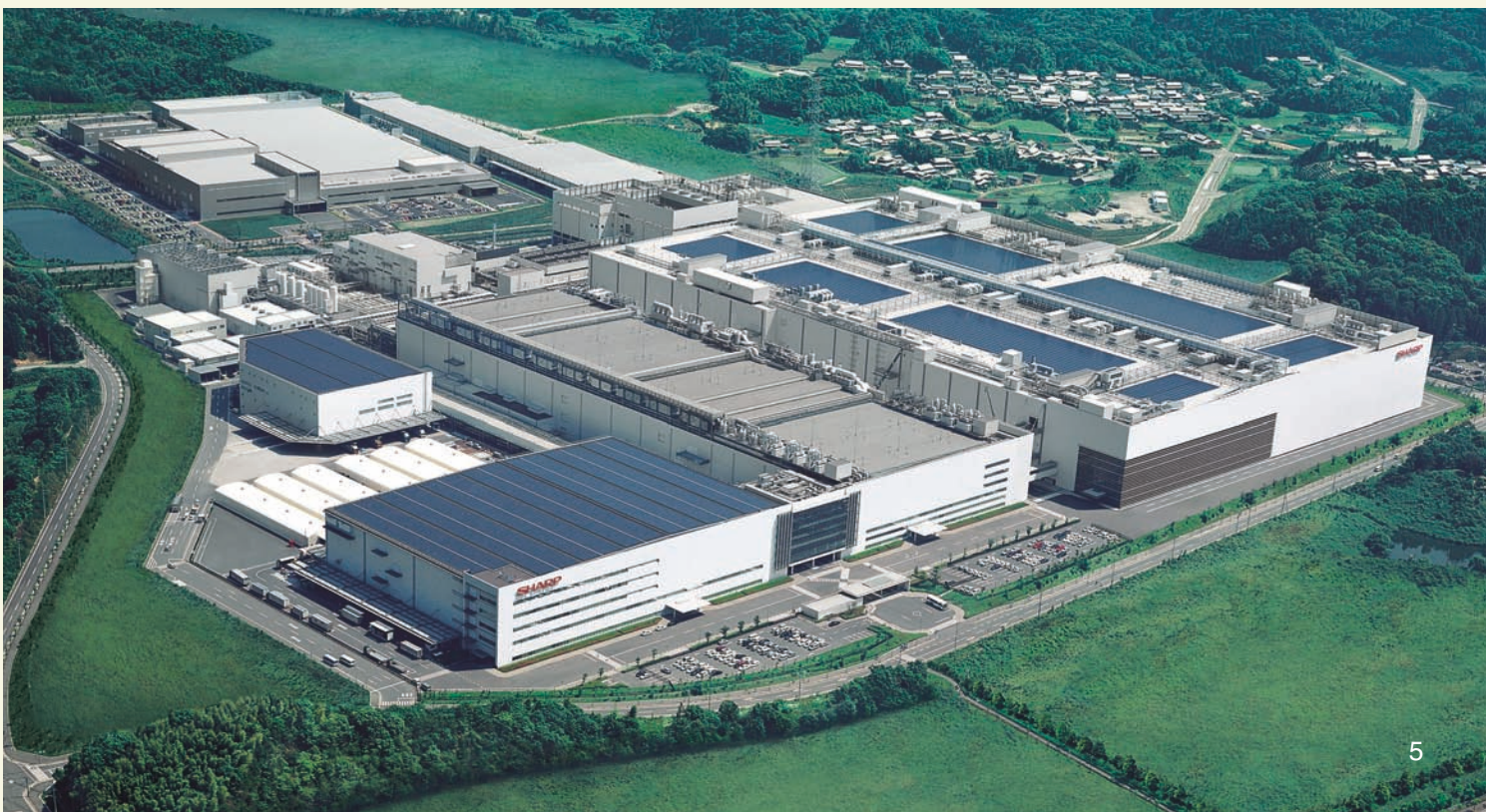
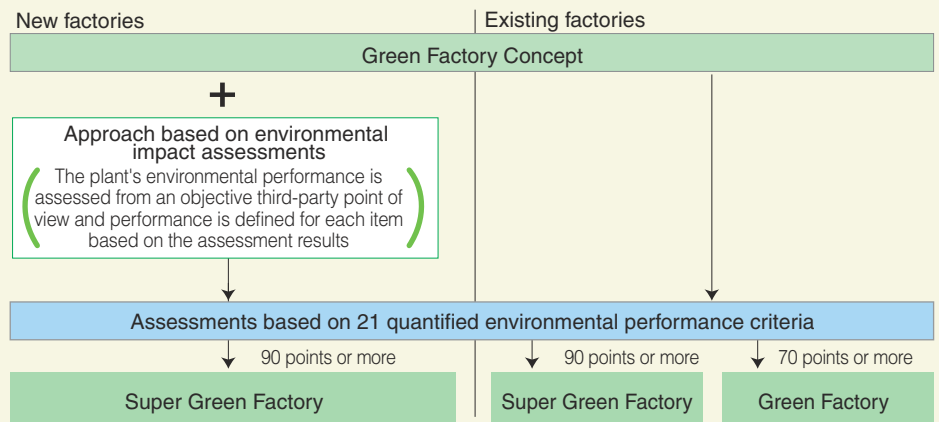
■The Green Factory concept

Greenhouse gases	Minimize emission of greenhouse gases	Atmosphere, water, soil	Minimize environmental burden on the atmosphere, water and soil
Energy	Minimize energy consumption	Harmony with nature	Endeavor to preserve nature both on and off site
Waste	Minimize discharge of waste	Harmony with the community	Encourage harmony with the local community
Resources	Minimize resource consumption	Environmental consciousness	High environmental awareness among employees
Chemical substances	Minimize risk of environmental pollution and accidents caused by chemical substances	Information disclosure	Disclose information on the environment

Certification of Green Factories and Super Green Factories

Quantified environmental performance criteria are used to assess and approve a plant for certification. A plant must score 70 or more points out of a possible 100 in the assessment process to earn Green Factory certification, while scoring 90 or more points will result in Super Green Factory certification. Plans call for turning all Sharp Corporation production sites in Japan into Super Green Factories and all production sites in the Sharp Group to Green Factories or higher by the end of fiscal 2007. In fiscal 2006, three domestic bases and two overseas bases achieved Super Green Factory status, while a total of 10 bases in Japan and overseas earned Green Factory certification.

■Process required to achieve Super Green Factories



From “Green” Factories to “Super Green” Factories

Sharp’s First Super Green Factory Kameyama Plant

AVC Liquid Crystal Display Group (Kameyama, Mie Prefecture)

The Kameyama Plant is Sharp’s first “Super Green Factory,” a compilation of the company’s environmental protection technologies. In preparing for construction, we gave a great deal of careful consideration to protecting the environment, beginning at the initial design stage. Working in consultation with local governments and with nearby residents, we carefully selected the parameters that would be subject to environmental protection measures. We chose the standards that would apply, and confirmed them through evaluation by independent experts. Also, when building the Kameyama Plant No. 2, we took the opportunity to introduce the latest environmental technology to make it one of the world’s most advanced “Super Green” factories.



An Efficient and Environment-Friendly Integrated Production System

The entire process is carried out in a single plant—from fabricating the LCD panels to final assembly. This system makes it possible to consolidate technical departments and strengthen our development capabilities, as well as shorten the lead-time from order to shipping. Eliminating the need to ship sub-assemblies between distant plants has also enabled us to slash the amount of packaging materials required for shipping and reduce emissions such as carbon dioxide (CO₂).

Countering Global Warming by Unifying Diverse Power Sources Distributed over a Wide Area

The Kameyama plant generates one-third of its annual electricity consumption and has reduced CO₂ emissions to about 40% lower than previous levels by means of a cogeneration system* using liquefied natural gas (LNG) (approx. 26,400 kW), as well as one of the largest fuel cell systems in Japan (approx. 1,000 kW), and one of the world’s largest photovoltaic (PV) power generation systems (5,210 kW).

* Cogeneration system: A system designed to save energy by using city gas to generate electricity. The waste heat generated is then used in applications such as air conditioning, hot water supply and steam electricity generation.

The Kameyama Plant Receives Japan Sustainable Management Award

The Kameyama Plant in Japan was recognized for its outstanding environmental sustainability management by being chosen from among 125 applicants for the highest honor, the Sustainable Management Pearl Award, in the 2004 Japan Sustainable Management Awards* (sponsored by the Japan Sustainable Management Awards Committee and Mie Prefecture). This award shows the high esteem for the environmental measures—including 100% recycling of manufacturing process wastewater, the introduction of a cogeneration system and the installation of a photovoltaic power system—taken by the Kameyama Plant, Sharp’s first Super Green Factory.

The Kameyama Plant received the first Minister of Economy, Trade and Industry Award in the 8th Japan Water Prize (2006) and the Energy Saving Encouraging Prize in the 4th Excellent Cogeneration System Commendation (FY 2005) sponsored by the Japan Cogeneration Center.

* The Japan Sustainable Management Awards honor all organizations across the nation, no matter what their size or type of business—including private companies, NPOs and schools—that demonstrate outstanding results of their environmental sustainability management efforts.

Creating Energy at the Factory for Energy-Saving Products, Using One of the World’s Largest* PV Power Generation Systems

In addition to the existing 60-kW photovoltaic (PV) power generation system, new PV power generation systems, in a total area of approx. 47,000 m² and with a total output of 5,150 kW, have been installed. Located at the large-screen LCD TV factory, the distribution building, and on the roof and curtain wall of the Kameyama Plant No. 2, these systems generate an annual electricity output that would power 1,300 average Japanese households.

* As a building-installed system. Survey by Sharp.

Water Purifying System—100% Water Recycling in the Production Process

The plant collects all the wastewater from the production process of liquid crystal panels, etc. (max. 28,300 tons a day) and recycles it 100% with water purification techniques using microorganism treatment. Malodorous wastewater containing chemicals is deodorized using peat moss* from Ishikari River, Hokkaido.

* Bog moss decomposed and piled up for several thousands of years.

Mie Plant Becomes First Existing Factory to Achieve Super Green Status

Mobile Liquid Crystal Display Group (Taki, Mie Prefecture)

The results described below are major efforts in upgrading to a Super Green Factory.

Fluoric Acid Effluent Recycling System Honored at 2004 WASTEC Award

The Mie Plant No. 3 uses fluoric acid in its continuous grain silicon production process. The plant developed this system and has been using it since 2004 to recover and recycle the fluoric acid effluent. This system was recognized for its excellence and won the Business Activity Category Prize at the 2004 WASTEC (Waste Control and Recycling Technology Exhibition) Awards in Japan in November 2004. Prior to the introduction of this system, the fluoric acid from the effluent was used to make cement. Now it can be used repeatedly at the production site, while the distilled water from the effluent can be used as pure water.

Waste Reduction Efforts

In 2004, we achieved zero discharge to landfill, eliminating waste by recycling all possible waste materials. Efforts are being made to further reduce emission of waste products by expanding the sale of valuable materials for reuse.

Energy-Saving Efforts

Since its completion, the Mie Plant has been strongly focused on energy conservation. In fiscal 2006 our efforts were recognized with an Agency for Natural Resources and Energy Director-General Prize for energy-efficient plant management. In addition, three members of the Mie Environmental Safety Promotion Center, who have been engaged in energy-saving efforts for many years, received prizes in recognition of their achievements in energy management. These awards are a testament to Sharp’s energy management and energy-saving efforts.

CO₂ Emissions Reduced through PV Power System Installation

The Mie Plant No. 3 installed a 180-kW photovoltaic power system on its south exterior wall. The system began generating electricity in March 2005. Used mainly to provide lighting for all non-manufacturing rooms, the system generated 141,000 kWh of power in fiscal 2006 and contributed to the reduction of about 60 tons of CO₂ emissions.



Participation in Environmental Education Programs at Local Schools

As part of our community outreach program, we have been cooperating with eight local schools in the town of Taki (one senior high, two junior high, and five elementary schools) on various educational projects, including factory tours, classes taught by visiting lecturers, and joint environmental activities.

Participation in Local Environmental Activities

The Mie Plant is actively involved in mitigating the impact of the plant on the surrounding environment, and is also engaged in local environmental preservation activities focused on the area’s mountains, rivers, and roads. We have received acclaim from local people for our participation in these activities, including the upkeep of the local forest as a water source, the maintenance of the neighboring forests and mountains, the cleaning of the Sanagawa River as the plant’s effluent stream, and the planting of flowers on National Route 42.

Green Factory Activities at Key Electronic Device Factories



**Advanced Development and Planning Center/
Corporate Research and Development Group
(Tenri, Nara Prefecture)**

ISO 14001 certification: December 3, 1996

Adoption of a cogeneration system*

About 26% of facility power is provided through private power generation. Waste heat is used for heating or cooling and also supplied to a steam generator for power generation. This cuts facility CO₂ emissions by about 13%.

* An energy-saving system that generates power using municipal gas and uses the produced waste heat for heating or cooling, hot water supply and steam electricity generation, etc.

Installation of a solar generation system

Installation of solar panels with a generating capacity of 40 kW.

Waste fluid processing system based on natural purification*

Waste and the pollution load of released water are reduced by using a waste fluid treatment system for waste water containing alcohol or other organic components.

After treatment, water is given further high-level treatment and used as intermediate factory water, to ensure more effective use of water resources.

* A natural purification system based on micro-organisms, developed independently by Sharp. (Patented)

Promotion of zero emissions*

Zero emissions were achieved in fiscal 2002 through reclamation of waste into useful resources for other business fields. Efforts will continue to further reduce waste emissions.

Installation of environmental equipment

In fiscal 2007, equipment for the safe disposal of PFC gas and gases subject to the Pollutant Release and Transfer Register (PRTR) Law was installed and factory wastewater was converted to sewerage, with the objective of minimizing environmental impact.

Relations with the local community

As the only Sharp establishment that has an ancient burial mound on its grounds, the center's employees are actively involved in the maintenance of the mound. In August of each year, the center invites employees and their families and local people to a "Sharp Festa." An environmental exhibition space is prepared to showcase the environmental activities of the center.



**Solar Systems Group
Electronic Components Group
(Katsuragi, Nara Prefecture)**

ISO 14001 certification: June 25, 1996

Prevention of water pollution

All waste water from production processes and laboratories is purified at a waste water treatment station within the factory. Water is released into the sewer only after treatment based on voluntary standards stricter than environmental standards.

Prevention of air pollution

Waste gases from acids and organic solvents produced by production processes and laboratories are purified with two types of waste gas treatment equipment, depending on the properties of the chemical substances. Eight acid scrubbers and 11 solvent scrubbers are installed on the roof of the Katsuragi Plant, and these keep atmospheric emissions of chemical substances below 1/10th of regulatory levels.

Promotion of zero emissions*

In fiscal 2001, the factory achieved zero emissions through recycling of all materials. It is now working to reduce waste volume with the goal of a final disposal rate of 0.2%.

Installation of solar generation system

In fiscal 2003, solar panels were installed at the solar park on the roof of the No. 3 Plant and on the employee recreation building. At present the solar generation system has a total capacity of 194.5 kW, and this electricity is used for tasks such as air conditioning.

Relations with the local community

In October of each year, the factory holds a "Katsuragi Festa" to improve relations with the local community and showcase the site's environmental activities.

From a Green Factory to a Super Green Factory

With the aim of becoming a Super Green Factory in fiscal 2007, the site is working to reduce emissions of harmful chemical substances used in processes and to recycle cleaning water used in production.



**LSI Group
(Fukuyama, Hiroshima
Prefecture)**

ISO 14001 certification: September 24, 1996

Inauguration of a non-dilution nitrogen treatment plant

The Group built a new plant that uses the world's first non-dilution treatment technology on the nitrogen contained in semiconductor plant wastewater. The technology combines "micro-nanobubble technology" with a unique microorganism treatment technology Sharp developed in June 2005. Operation of the plant began in July 2006.

Promotion of zero emissions*

Zero emissions were achieved in 2001 through ongoing efforts such as in-house treatment of developing fluid by means of our own micro-organism treatment technology, reduction of the volume of process sludge produced, and recycling of waste into useful material. Our "zero emissions" status continues to this day.

Prevention of global warming

An energy conservation committee has been formed to promote energy conservation efforts involving the entire Group. Efforts such as building a unique energy-saving outer air treatment system have been highly regarded, and the Group received a "2005 Excellent Energy Conservation Factory & Building (electricity category)" award from the Director-general of the Agency for Natural Resources and Energy.

Relations with the local community

In August of each year, employees and their families and local people are invited to the "Family Day in Sharp (Summer Festival)." At this festival, an environmental exhibition space is prepared to provide an opportunity for people to experience nature and to introduce the environmental protection efforts of the facility.

The plant also implemented the semiconductor industry's first full-scale risk communication system (July 2005), and still continuously holds meetings with local residents (once a year) in order to gain a better understanding of them. Furthermore, the plant jointly produced a large communication panel (4 m x 6 m) called "Daimoncho—Yesterday and Today" in cooperation with the local residents who approved and supported our efforts. The panel is on display at our premises and is being used to introduce our business and Daimoncho to visitors. Communication activities such as these have been highly evaluated, and the Group received the "2005 PRTR Prize" sponsored by the Center for Environmental Information Science.



**Electronic Components Group
Mihara Plant
(Mihara, Hiroshima Prefecture)**

ISO 14001 certification: November 17, 2003

Prevention of global warming

The precise air-conditioning necessary for production activities is maintained by operating coolers and boilers on municipal gas, which produces little CO₂. The turbo coolers provided in air-conditioning equipment use a waste heat recovery system. A remover optimized for greenhouse gases is provided to suppress emission of such gases and prevent global warming.

Installation of a solar generation system

In February 2007, solar panels with a generating capacity of 20 kW were installed on the roof of the No. 2 Plant.

Promotion of zero emissions*

Zero waste emission has been achieved through active efforts to reduce and reclaim waste, instituted from the beginning of the facility.

Efforts to prevent pollution

After treatment at an in-house facility, all process waste water is discharged into the public sewer only after clearing voluntary standards stricter than waste water standards. Sludge produced in waste water treatment is sorted by type and reclaimed.

Measures are taken such as installing equipment indoors to prevent noise escaping to the surrounding area from noisy equipment, such as large fans and large compressors. Noise levels at the site boundary are within regulation values.

The plant is working to improve management of chemical substances, prevent accidents and environmental disasters, and reduce environmental impact.

Efforts to contribute to the local community

Through efforts such as inviting local people to festivals and activities to protect forests, the plant aims to deepen relations with people in the local area and protect the environment. Efforts are being made to beautify the area by participating in greenification activities in the Mihara Western Industrial District where this facility is located.

* Sharp defines this as bringing the amount of buried waste (final disposal amount) as close to zero as to be negligible.

In figures, a final disposal rate of less than 0.5% (final disposal rate = buried amount / total discharged amount x 100) is taken to be zero emissions.



■ LCD Modules

<For industrial appliances> (1)

Display size	Model No.	Number of pixels (dot) H × V	Pixel pitch (mm) H × V	Display colors	Luminance (cd/m ²)	Input video signal	Power consumption (W)	Outline dimensions (mm) W × H × D	Weight (g)	Backlight	Remarks	
28.3" (72cm)	☆LQ283G1TW13	2 560 × RGB × 2 048	0.219 × 0.219	16.77 M	225	4ch TMDS	103.2	640.0 × 530.0 × 60.0	Max. 15 000	18CCFT	Built-in inverter	
28.1" (71cm)	☆LQ281L1LW14	2 048 × RGB × 2 048	0.246 × 0.246	16.77 M	225	4ch LVDS	TBD	594.0 × 594.0 × 83.0	15 000	18CCFT	Built-in inverter	
23.1" (59cm)	LQ231U1LW01	1 600 × RGB × 1 200	0.294 × 0.294	16.77 M	250	LDI	54.9	530.0 × 432.8 × 32.5	Max. 5 500	6CCFT	Built-in inverter	
	LQ231U1LW21										Expanded backlight brightness adjustment area	
20.1" (51cm)	LQ201U1LW11Z	1 600 × XYZ × 1 200	0.255 × 0.255	256 (gray scales)	700	2ch LVDS 8 bit XYZ	32.9	436.0 × 335.0 × 27.5	Max. 3 800	6CCFT		
	LQ201U1LW21	1 600 × RGB × 1 200		16.77 M	250	2ch LVDS 8 bit RGB	33.8	432.0 × 331.5 × 25.0	3 200			
19.0" (48cm)	☆LQ190E1LW02	1 280 × RGB × 1 024	0.294 × 0.294	16.77 M	300	2ch LVDS 8 bit RGB	(25.5)	404.2 × 330.0 × 20.0	Max. 2 800	4CCFT		
	☆LQ190E1LW42				450		(38.3)	404.2 × 330.0 × 22.0	Max. 3 200	6CCFT		
15.0" (38cm)	LQ150X1LGB1	1 024 × RGB × 768	0.297 × 0.297	16 M	600	1ch LVDS	16.0	331.6 × 254.76 × 12.5	1 200±50	4CCFT	Compliant with the PSWG standard	
	☆LQ150X1LG45				250							
	☆LQ150X1LG55				350		9.6	326.5 × 253.5 × 11.2 TYP.				
	☆LQ150X1LG71				250							
	☆LQ150X1LG81				350		5.5	326.0 × 252.0 × 11.2				
	LQ150X1LW71N				250							
	LQ150X1LW72				350		18.1	331.6 × 254.76 × 12.5	Max. 1 300	4CCFT		Advanced Super View LCD
									Max. 1 350			
12.1" (31cm)	☆LQ121K1LG11	1 280 × RGB × 800	0.204 × 0.204	16 M	370 TYP.	LVDS	4.6	278.0 × 184.0 × 11.3 TYP.	640		12.1" wide XGA	
	LQ121S1DG41	800 × RGB × 600	0.3075 × 0.3075	260 k	370	Digital 6 bit RGB	8.3	276.0 × 209.0 × 11.0	Max. 660	2CCFT	Strong LCD2	
	LQ121S1DG61				450				Max. 800			
	LQ121S1LG41				370				Max. 660			
	LQ121S1LG61				450	LVDS 6 bit RGB			8.5			Max. 800
	LQ121S1LW01				250	Max. 800						
	LQ121S7LY01				200	Max. 800						
					Max. 800							
10.4" (26cm)	LQ104S1DG21	800 × RGB × 600	0.264 × 0.264	260 k	350	Digital 6 bit RGB	6.5	246.5 × 179.4 × 15.5	Max. 620	2CCFT	Strong LCD2	
	LQ104S1DG31				350		6.6	243.0 × 183.8 × 11.5	Max. 600			
	☆LQ104S1DG61				420		8.0	246.5 × 179.4 × 13.7	Max. 620			
	LQ104S1LG21				350	6.6	246.5 × 179.4 × 15.5	(600)				
	☆LQ104S1LG31				350	(6.6)	243.0 × 183.8 × 11.5					
	☆LQ104S1LG61				420	8.0	246.5 × 179.4 × 13.7		Max. 620			

Notice

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<For industrial appliances> (2)

	Display size	Model No.	Number of pixels (dot) H×V	Pixel pitch (mm) H×V	Display colors	Luminance (cd/m ²)	Input video signal	Power consumption (W)	Outline dimensions (mm) W×H×D	Weight (g)	Backlight	Remarks	
TFT	10.4" (26cm)	LQ104V1DG21	640 × RGB × 480	0.330 × 0.330	260 k	350	Digital 6 bit RGB	6.4	265.0 × 195.0 × 11.5	Max. 700	2CCFT		
		LQ104V1DG51							246.5 × 179.4 × 15.5			Max. 620	
		LQ104V1DG61							246.5 × 179.4 × 13.7				Strong LCD2
		☆LQ104V1DG62						TBD	246.5 × 179.4 × (Max. 12)	TBD	LED	Strong LCD2 LED backlight	
		LQ104V1LG61						6.3	246.5 × 179.4 × 13.7	Max. 620	2CCFT		
		LQ104V1DW02					380	Digital 6 bit RGB	246.5 × 179.4 × 15.5			Advanced Super View LCD	
	8.5" (22cm)	☆LQ085Y3DG06	800 × RGB × 480	0.231 × 0.231	260 k	260	Digital 6 bit RGB	5.79	212.0 × 134.0 × 12.5	370 TYP.	1CCFT	Wide	
	8.4" (21cm)	LQ084S3DG01	800 × RGB × 600	0.213 × 0.213	16 M	350	Digital 6 bit RGB	3.7	199.5 × 149.5 × 11.6	Max. 405	2CCFT		
		LQ084S3LG01	800 × RGB × 600									400	LVDS 6 bit + 2FRC RGB
		LQ084V3DG01	640 × RGB × 480	0.270 × 0.270	260 k	400	Digital 6 bit RGB	5.7		Max. 400			
		LQ084V1DG21	640 × RGB × 480	0.267 × 0.270						300	5.5	216.0 × 152.4 × 12.0	Max. 430
	7.5" (19cm)	LQ075V3DG01	640 × RGB × 480	0.237 × 0.237	260 k	400	Digital 6 bit RGB	5.7	179.0 × 139.5 × 12.7	Max. 365	1CCFT	Strong LCD2	
	6.4" (16cm)	LQ064V3DG01	640 × RGB × 480	0.204 × 0.204	260 k	350	Digital 6 bit RGB	4.7	161.3 × 117.0 × 12.0	Max. 280	2CCFT		
		LQ064V3DG04										290	Best viewing angle: 3 o'clock direction Ideal for vertical use
	5.7" (14cm)	LQ057V3DG01	640 × RGB × 480	0.180 × 0.180	260 k	400	Digital 6 bit RGB	4.1	144.0 × 104.6 × 12.3	Max. 250	1CCFT	Strong LCD2	
		☆LQ057V3DG02							4.5	(144.0 × 104.6 × 13.0)	TBD	LED	LED backlight
		LQ057Q3DC12	320 × RGB × 240	0.360 × 0.360	500	3.9	144.0 × 104.6 × 13.0	Max. 240	1CCFT				
	5.0" (13cm)	LQ050Q5DR01	320 × RGB × 240	0.3165 × 0.3115	380	Digital 6 bit RGB	4.2	119.4 × 89.1 × 12.7		Max. 170			
	3.8" (10cm)	LQ038Q3DC01	320 × RGB × 240	0.240 × 0.240	260 k	240	Digital 6 bit RGB	0.7	90.6 × 79.9 × 9.9	Max. 105	LED	LED backlight	
	3.5" (9cm)	☆LQ035Q3DG01		0.2205 × 0.2205		(450)	TBD	76.9 × 63.9 × TBD	33	LED	LED backlight		
2.5" (6cm)	☆LQ025Q3DW02	0.156 × 0.156		350 TYP.		6 bit RGB	0.28	56.8 × 48.8 × Max. 3.5	Max. 25	LED	LED backlight 2.5" QVGA		

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<For Information display>

Display size (cm) ["]	Model No.	Number of pixels*1	Dot format H x V (dot)	Active area H x V (mm)	Number of colors (color)	Outline dimensions*2 W x H x D (TYP.) (mm)	Backlight	Video interface (Input video signal)	Remarks
163.9 [64.5]	LK645D3LZ2U	2 073 600	1 080 x 1 920 x RGB	803.52 x 1 428.48	16.77M	907.0 x 1 555.3 x 100.0	Built-in	LVDS*3 (8-bit digital)	Portrait Advanced Super View LCD High luminance: 450cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: 2 000:1 High-speed response [G to G]: 6ms (Ave.)
	LK645D3LZ29		1 920 x RGB x 1 080	1 428.48 x 803.52		1 555.3 x 907.0 x 100.0			Advanced Super View LCD High luminance: 450cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: 2 000:1 High-speed response [G to G]: 6ms (Ave.)
132.2 [52]	LK520D3LZ19	2 073 600	1 920 x RGB x 1 080	1 152.0 x 648.0	16.77M	1 219.0 x 706.7 x 64.6	Built-in	LVDS*3 (8-bit digital)	Advanced Super View LCD High luminance: 450cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: 1 800:1 High-speed response [G to G]: 6ms (Ave.)
116.8 [46]	LK460D3LZ19		1 920 x RGB x 1 080	1 018.08 x 572.67		1 083.0 x 627.0 x 65.7			Advanced Super View LCD High luminance: 450cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: 1 800:1 High-speed response [G to G]: 6ms (Ave.)

*1 Pixel means a set of each RGB dot.

*2 Excluding FPC for connection and other protruding parts.

*3 LVDS: Low Voltage Differential Signaling

(Note) Please note that the specifications are subject to change without prior notice for production improvement.

<For LCD TVs>

Display size (cm) ["]	Model No.	Number of pixels*1	Dot format H x V (dot)	Active area H x V (mm)	Number of colors (color)	Outline dimensions*2 W x H x D (TYP.) (mm)	Backlight	Video interface (Input video signal)	Remarks
132.2 [52]	LK520D3LZxx	2 073 600	1 920 x RGB x 1 080	1 152.0 x 648.0	16.77M	(1 219.0 x 706.7 x 64.6)	Built-in	LVDS*3 (8-bit digital)	Advanced Super View LCD High luminance: 450cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: (1 500:1) 120Hz drive compatible
116.8 [46]	LK460D3LZxx	2 073 600	1 920 x RGB x 1 080	1 018.08 x 572.67		(1 083.0 x 627.0 x 65.7)			Advanced Super View LCD High luminance: 500cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: (1 500:1) 120Hz drive compatible
80.0 [31.5]	LK315T3LZxx	1 049 088	1 366 x RGB x 768	697.69 x 392.26		(760.0 x 450.0 x 50.1)			Advanced Super View LCD High luminance: 500cd/m ² Wide viewing angle: L/R 176°/ U/D 176° High contrast: (1 500:1) High-speed response [G to G]: 6ms (Ave.)

*1 Pixel means a set of each RGB dot.

*2 Excluding FPC for connection and other protruding parts.

*3 LVDS: Low Voltage Differential Signaling

(Note) Please note that the specifications are subject to change without prior notice for production improvement.

Notice

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<For automotive applications> (1)

- LQ065T9DZ03/LQ088H9DZ03: operating temperature (panel surface temperature) –40 to +85°C / storage temperature –40 to +95°C
- LQ070Y5DG06/LQ080Y5DG03: operating temperature (panel surface temperature) –30 to 85°C / storage temperature –40 to 95°C
- Other models: operating temperature (panel surface temperature) –30 to 85°C / storage temperature –40 to +85°C

	Display size (cm) ["]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input signal system	Input video signal	Back-light	Luminance (cd/m ²) (TYP.)	Power consumption (mW) (TYP.)	Outline dimensions*10 W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
TFT	7.8 [3.1]	LQ031B5DG01	270 × RGB × 96*1	0.273 × 0.273	73.7 × 26.2	6-bit digital RGB	6-bit digital	Built-in LED	350	700	85.4 × 38.8 × 8.65	44	"Compact LCD" suitable for display in meter, Wide screen (8 : 3), LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
	8.3 [3.3]	LQ033B5DG02	160 × RGB × 176*2	0.351 × 0.349	56.2 × 61.4	6-bit digital RGB	6-bit digital	Built-in 1CCFT	290	1 800	73 × 78.3 × 12.5	90	"Compact LCD" suitable for display in meter, High-speed response (8 : 3), LED backlight, 260K-color display, Wide viewing angle, RoHS compliant
	8.9 [3.5]	★LQ035Q5DG02	320 × RGB × 240*3	0.222 × 0.222	71.0 × 53.3	6-bit digital RGB	6-bit digital	Built-in LED	500	TBD	86.4 × 84 × 6.7	65	"Compact LCD" suitable for display in meter, LED backlight, High luminance, Thin, High-speed response (low temperature), 260K-color display, Wide viewing angle, RoHS compliant
	15 [6.1]	LQ061T5GG01	480 × RGB × 234*4	0.284 × 0.308	136.1 × 72.0	NTSC/PAL*11	TFT specific analog RGB*12	Built-in 1CCFT	500	3 200	149 × 82.9 × 7.2	160 (Max.)	Wide QVGA (17:9), Thin, High luminance, Wide viewing angle, RoHS compliant
	16 [6.5]	LQ065T5GG61	400 × RGB × 234*5	0.359 × 0.339	143.4 × 79.3	NTSC/PAL*11	TFT specific analog RGB*12	Built-in 1CCFT	400	3 300	155 × 89.2 × 8.8	175 (Max.)	Wide QVGA (16:9), Thin, Wide viewing angle, RoHS compliant
		LQ065T5DG02	400 × RGB × 240*6	0.359 × 0.331	143.4 × 79.3	6-bit digital RGB	6-bit digital	Built-in 1CCFT	620	4 100	155 × 89.2 × 9.1	170	Wide QVGA (16:9), Digital I/F, 260K-color display, High luminance, Wide viewing angle, RoHS compliant
LQ065T9DZ03		400 × RGB × 240*6	0.359 × 0.331	143.4 × 79.3	6-bit digital RGB	6-bit digital	Built-in 1CCFT	250	5 200	155 × 89.2 × 12.5	205 (Max.)	"Super Mobile LCD" with high visibility under bright ambient light, Wide QVGA (16:9), Wide viewing angle, Gray-scale inversion free, 260K-color display, RoHS compliant	

*1 Number of pixels: 25 920

*4 Number of pixels: 112 320

*7 Number of pixels: 384 000

*10 Excluding FPC for connection and other protruding parts.

*11 MBK-PAL system is adopted as PAL. The LCD panel has 234 (240) scanning lines, and displays a picture of 273 (274) virtual scanning lines.

*12 Video interface: External (Device specific external video interface IC is available.)

(Note) Please refer to the latest relevant specification sheets before using these devices.

*2 Number of pixels: 28 160

*5 Number of pixels: 93 600

*8 Number of pixels: 115 200

*3 Number of pixels: 76 800

*6 Number of pixels: 96 000

*9 Number of pixels: 153 600

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☆New product
★Under development

<For automotive applications> (2)

- LQ065T9DZ03/LQ088H9DZ03: operating temperature (panel surface temperature) -40 to +85°C / storage temperature -40 to +95°C
- LQ070Y5DG06/LQ080Y5DG03: operating temperature (panel surface temperature) -30 to 85°C / storage temperature -40 to 95°C
- Other models: operating temperature (panel surface temperature) -30 to 85°C / storage temperature -40 to +85°C

Display size (cm) ["]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input signal system	Input video signal	Back-light	Luminance (cd/m ²) (TYP.)	Power consumption (mW) (TYP.)	Outline dimensions*10 W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
18 [7]	LQ070T5GG21	480 × RGB × 234*4	0.326 × 0.352	156.2 × 82.4	NTSC/PAL*11	TFT specific analog RGB*12	Built-in 1CCFT	500	3 500	167 × 93 × 6.9	195 (Max.)	Wide QVGA (17:9), Thin, High luminance, Wide viewing angle, RoHS compliant
	☆LQ070T5DR05	480 × RGB × 240*8	0.321 × 0.363	154.1 × 87.0	6-bit digital RGB	6-bit digital	Built-in 2CCFT	400	5 100	170.1 × 103.4 × 14.2	280 (Max)	Wide QVGA (16:9), Digital I/F, 260K-color display, Wide viewing angle
	★LQ070Y5DG20	800 × RGB × 480*7	0.195 × 0.1725	156.0 × 82.8	6-bit digital RGB	6-bit digital	Built-in 1CCFT	500	TBD	167 × 93 × 7.2	TBD	High resolution (wide VGA/17:9), Thin, W-QVGA (GG21) vertical/horizontal compatible, 260K-color display, Wide viewing angle, RoHS compliant
	☆LQ070Y5DG06	800 × RGB × 480*7	0.191 × 0.191	152.4 × 91.4	6-bit digital RGB	6-bit digital	Built-in LED	430*	TBD	170 × 104 × 8.0	TBD	High resolution (wide VGA/15:9), High color purity (65% of NTSC), High-speed response (low temperature), LED backlight, Thin, 260K-color display, Wide viewing angle, RoHS compliant, * Luminosity at eye point
	LQ070Y5DE02	800 × RGB × 480*7	0.195 × 0.1725	156.0 × 82.8	6-bit digital RGB	6-bit digital	Built-in LED	320*	5 250	167.5 × 93.2 × 6.5 to 9.0	215 (Max.)	Dual directional viewing LCD, Wide screen (17:9), LED backlight, Thin, 260K-color display, Wide viewing angle, RoHS compliant, * DV luminosity at eye point
20 [8]	★LQ080Y5DG03	800 × RGB × 480*7	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital	Built-in LED	430*	TBD	190 × 120 × 8.0	TBD	High resolution (wide VGA/15:9), High color purity (65% of NTSC), High-speed response (low temperature), LED backlight, Thin, 260K-color display, Wide viewing angle, RoHS compliant, * Luminosity at eye point
	LQ080Y5DG04	800 × RGB × 480*7	0.2175 × 0.2175	174.0 × 104.4	6-bit digital RGB	6-bit digital	Built-in 2CCFT	625	5 900	190 × 120 × 13	392	High resolution (wide VGA/15:9), High-speed response (low temperature), High luminosity, 260K-color display, Wide viewing angle
	★LQ080Y5CGXX	800 × RGB × 480*7	0.222 × 0.207	177.6 × 99.4	NTSC/PAL/PAL (60)	Composite	Built-in 1CCFT	400	10 400	198 × 117 × 17.9	391	High resolution (wide VGA/16:9), All-in-one, Wide viewing angle, RoHS compliant
22 [8.8]	LQ088H9DZ03	640 × RGB × 240*9	0.327 × 0.327	209.3 × 78.5	6-bit digital RGB	6-bit digital	Built-in 2CCFT	250	7 100	231.6 × 103.25 × 14.4	370 (Max.)	"Super Mobile LCD" with high visibility under bright ambient light, Wide screen (8:3), Wide viewing angle, Gray-scale inversion free, 260K-color display, RoHS compliant

*1 Number of pixels: 25 920

*4 Number of pixels: 112 320

*7 Number of pixels: 384 000

*10 Excluding FPC for connection and other protruding parts.

*11 MBK-PAL system is adopted as PAL. The LCD panel has 234 (240) scanning lines, and displays a picture of 273 (274) virtual scanning lines.

*12 Video interface: External (Device specific external video interface IC is available.)

(Note) Please refer to the latest relevant specification sheets before using these devices.

The Tenri site NF3 (JQA-AU0121-1) and plants No. 1 and No. 2 (JQA-AU0121-2) at the Mie site of the Mobile Liquid Crystal Display Group have been certified under the ISO/TS 16949:2002 Quality Management System. [Certifying organization: Japan Quality Assurance Organization (JQA)]

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<For personal AV equipment>

	Display size (cm) ["]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input signal system	Input video signal	Backlight	Luminance (cd/m ²) (TYP.)	Outline dimensions* ³ W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
CG Silicon	6.8 [2.7]	☆LS027A8DZ01	960 × 240* ¹	0.0563 × 0.1688	53.97 × 40.50	NTSC/PAL* ²	8-bit digital RGB	Built-in LED	310	59.7 × 50.3 × 2.7	16	Super Mobile LCD with high outdoor visibility due to transfectivity, Top/bottom and left/right angle of view 160°, High contrast, Delta configuration
	6.8 [2.7]	LS027T3DG01		0.062 × 0.1395	59.49 × 33.48				250	65 × 45 × 2.5	13	High contrast, Wide screen, Delta configuration
	6.6 [2.7]	☆LS027A3DC02		0.0563 × 0.1688	53.972 × 40.5				480	63.19 × 46.36 × 2.5	14	High contrast, Delta configuration, FPC side positioning

*1 Number of Pixels: 230 400

*2 MBK-PAL system is adopted as PAL. The LCD panel has 234 (220) scanning lines, and displays a picture of 273 (256) virtual scanning lines.

*3 Excluding FPC for connection and other protruding parts.

* CG Silicon ... Continuous grain silicon technology developed jointly with Semiconductor Energy Laboratory Co. Ltd. is used.

(Note) Please refer to the latest relevant specification sheets before using these devices.

<For mobile phones>

	Display size (cm) ["]	Model No.	Dot format H × V (dot)	Pixel pitch H × V (mm)	Active area H × V (mm)	Input video signal	Backlight	Contrast ratio (Transmissive/ Reflective)	Luminance (cd/m ²) (TYP.)	Outline dimensions* ⁴ W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
CG Silicon	5.6 [2.2]	LS022Q8UX05	240 × RGB × 320* ¹	0.1395 × 0.1395	33.48 × 44.64	16-bit parallel CPU	Built-in LED	400 : 1 (Transmissive)/ 10 : 1 (Reflective)	300	39.2 × 58.35 × 2.3	T.B.D.	Super Mobile LCD with high outdoor visibility due to transfectivity, Top/bottom and left/right angle of view 160° (CR ≥ 5), High contrast, 260k-color display, RoHS compliant
	7.0 [2.75]	LS028B7UX01	240 × RGB × 400* ²	0.05 × 0.15	36.0 × 60.0	CPU bus		400 : 1	250	41.8 × 70.5 × 2.3	10	Transflective type, 260k-color display, RoHS compliant
TFT	4.5 [1.77]	☆LQ018B3UD02	128 × RGB × 160* ³	0.219 × 0.219	28.032 × 35.04	8/16-bit parallel CPU		350 : 1	250	33.3 × 47.0 × 2.25	T.B.D.	Transmissive type, RoHS compliant

*1 Number of Pixels: 76 800

*2 Number of Pixels: 96 000

*3 Number of Pixels: 20 480

*4 Excluding FPC for connection and other protruding parts.

* CG Silicon ... Continuous grain silicon technology developed jointly with Semiconductor Energy Laboratory Co. Ltd. is used.

(Note) Please refer to the latest relevant specification sheets before using these devices.

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■ EL Display Modules

Display size (cm) ["]	Model No.	Dot format H × V (dot)	Dot pitch H × V (mm)	Active area H × V (mm)	Areal luminance (cd/m ²) (TYP.)	Supply voltage (V)	Power consumption (W) (TYP.)	Operating temperature (°C)	Outline dimensions* ² W × H × D (mm) (TYP.)	Weight (g) (TYP.)	Remarks
23 [8.9]	LJ64H034	640 × 400	0.30 × 0.30	191.9 × 119.9	110* ¹	+5, +12	11	-5 to +55	246.0 × 175.0 × 19.0	450	High luminance, Wide viewing angle
	LJ089MB2S01				60				246.0 × 158.0 × 26.0	390	Wide viewing angle

*1 In case of frame frequency = 120 Hz










*2 Excluding FPC for connection and other protruding parts.

(Note) Please refer to the latest relevant specification sheets before using these devices.



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CMOS Camera Module Road Map

Image format	2006	2007	First half of 2008	Latter half of 2008
VGA	<p>LZOP399A</p>  <p>1/6 type 0.12 cc 5.8 x 5.8 x (H)3.7</p>		<p>★RJ6ABA200</p>  <p>1/10 type 0.06 cc 5.0 x 5.0 x (H)2.2</p>	<p>★RJ6ABA100</p>  <p>1/10 type 0.06 cc Wide viewing angle type 5.0 x 5.0 x (H)2.2</p>
1.3 M (SXGA)	<p>LZOP393M</p>  <p>1/4 type 0.31 cc 8.0 x 8.0 x (H)4.9</p>			
2 M (UXGA)		<p>LZOP39DS</p>  <p>1/4 type 0.39 cc Built-in auto focus function 8.5 x 8.5 x (H)5.4</p>	<p>★LZOP395V</p>  <p>1/4 type 0.28 cc 8.0 x 8.0 x (H)4.4</p>	<p>★RJ64NB100</p>  <p>1/4 type 0.26 cc Built-in macro function 8.0 x 8.0 x (H)4.0</p>
				<p>Under planning</p> <p>1/5 type 0.20 cc 7.0 x 7.0 x (H)4.1 (Target)</p>
				<p>Under planning</p> <p>1/5 type 0.28 cc Built-in auto focus function 7.5 x 7.5 x (H)4.9 (Target)</p>
3 M (QXGA)		<p>RJ64PC410</p>  <p>1/4 type 0.41 cc Built-in auto focus function 8.5 x 8.5 x (H)5.7</p>		<p>★RJ64PC510</p>  <p>1/4 type 0.38 cc Built-in auto focus function 8.5 x 8.5 x (H)5.3</p>

CMOS Image Sensors/CCDs

Model No.

Optical format & volume

Outline dimensions (mm)TYP.
(H): Module height

■ CMOS Camera Modules

Module configuration : CMOS image sensor, CDS/AGC/10-bit ADC, timing generator, DSP, lens

Color filter : R, G, B primary color mosaic filters

Operating temperature : -20 to 60°C

Optical format	Image format	Optical function	Model No.	Features	Output pixels (H x V) MAX.	Lens			Output signal	Supply voltage (V)	Power consumption (mW) TYP.	Package*1
						F No.	Configuration	Horizontal viewing angle (°)				
1/4 type	QXGA	Auto focus function	RJ64PC410	<ul style="list-style-type: none"> • QXGA to SubQCIF • 7.5 fps at QXGA/ 30 fps at XGA • 6.4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 	2 048 x 1 536	F2.8	3 pcs.	53	UYVY	2.8/1.8 (I/O: 1.8 or 2.8)	270 (at 7.5 fps)	30FPC type*2
		Auto focus function	★RJ64PC510	<ul style="list-style-type: none"> • QXGA to SubQCIF • 15 fps at QXGA/ 30 fps at XGA • 6.4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 								
	UXGA	—	★LZ0P395V	<ul style="list-style-type: none"> • UXGA to SubQCIF • 15 fps at UXGA/ 30 fps at SVGA • 5x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 	1 600 x 1 200	F3.2	57	200 (at 15 fps)			24LCC type	
		Auto focus function	LZ0P39DS	<ul style="list-style-type: none"> • 5x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 							30FPC type*2	
		Macro function	★RJ64NB100	<ul style="list-style-type: none"> • Image inversion function (right and left) 								
	SXGA	—	LZ0P393M	<ul style="list-style-type: none"> • SXGA to SubQCIF • 15 fps at SXGA/ 30 fps at 640 x 512 • 4.2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 	1 280 x 1 024	F3.4	56	220 (at 15 fps)	24LCC type			
1/6 type	VGA	—	LZ0P399A	<ul style="list-style-type: none"> • VGA to SubQCIF • 30 fps at VGA • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 	640 x 480	F2.8	2 pcs.	52	110 (at 30 fps)			
1/10 type	VGA	—	★RJ6ABA100	<ul style="list-style-type: none"> • VGA to SubQCIF • 30 fps at VGA • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left) 	640 x 480			55	70 (at 30 fps)	20LCC type		
			★RJ6ABA200	<ul style="list-style-type: none"> • Image inversion function (right and left) 		50						

*1 Contact a SHARP sales office regarding socket availability.

*2 Contact a SHARP sales office regarding FPC type package.

● Outline Dimensions

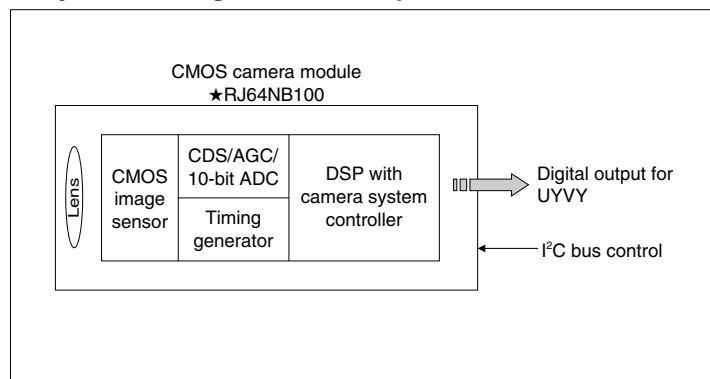
Model No.	Outline dimensions (mm) TYP.	Package*1
RJ64PC410	8.5 x 8.5 x (H) 5.7	30FPC type*2
★RJ64PC510	8.5 x 8.5 x (H) 5.3	
★LZ0P395V	8.0 x 8.0 x (H) 4.4	24LCC type
LZ0P39DS	8.5 x 8.5 x (H) 5.4	30FPC type*2
★RJ64NB100	8.0 x 8.0 x (H) 4.0	24LCC type
LZ0P393M	8.0 x 8.0 x (H) 4.9	
LZ0P399A	5.8 x 5.8 x (H) 3.7	
★RJ6ABA100	5.0 x 5.0 x (H) 2.2	20LCC type
★RJ6ABA200	5.0 x 5.0 x (H) 2.2	

(H): Module height

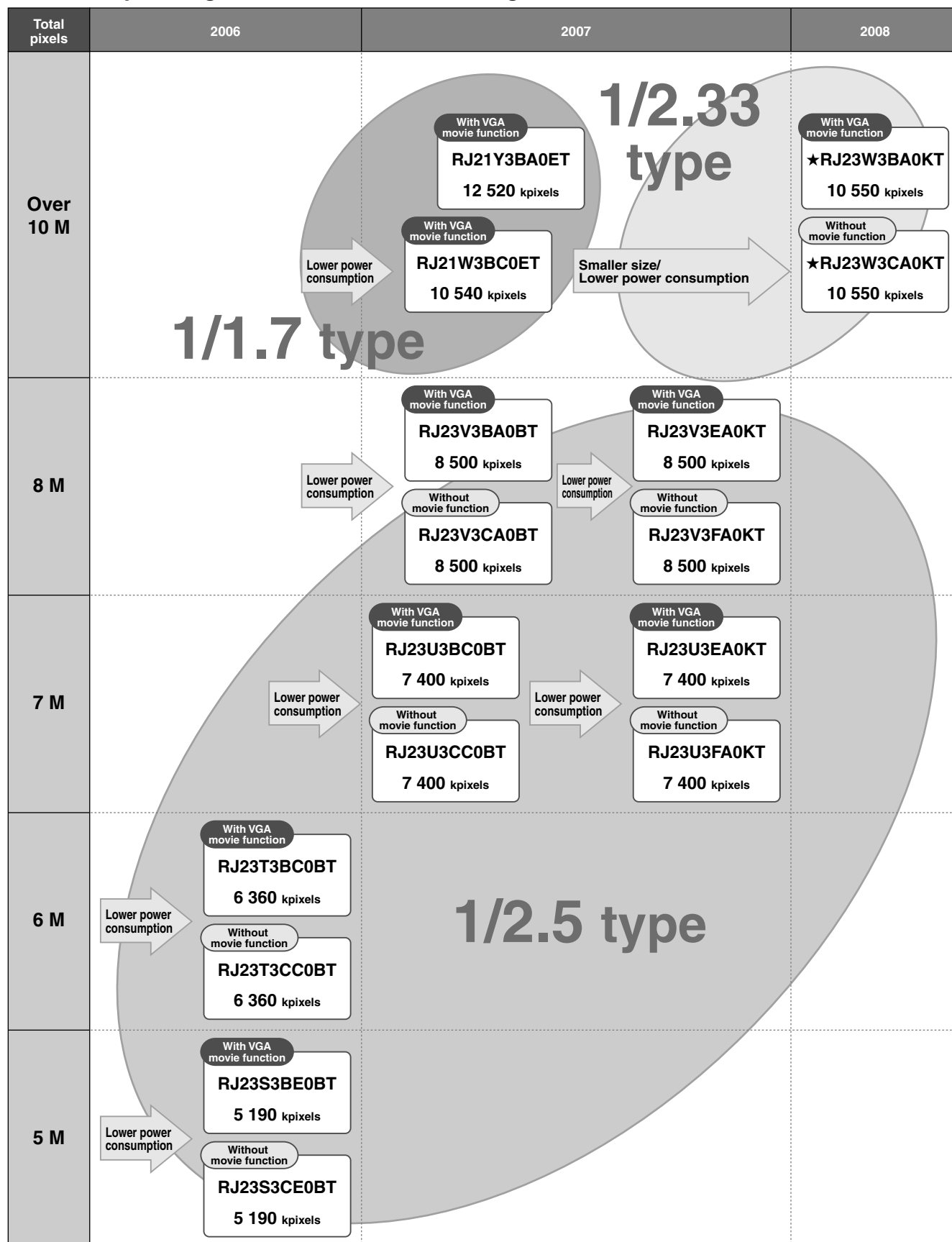
*1 Contact a SHARP sales office regarding socket availability.

*2 Contact a SHARP sales office regarding FPC type package.

● System Configuration Example



■ Road Map for Higher-resolution CCDs for Digital Cameras



CMOS Image Sensors/
CCDs

■ Higher-resolution CCDs

Optical format	Total pixels	Color filter	Model No.	30 fps VGA movie	Resolution	Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package	
					Image pixels (H x V)					
1/1.7 type	10 540 k	R,G,B primary color mosaic filters	RJ21W3BC0ET	○ (25 fps VGA movie)	3 704 x 2 784	2.05 x 2.05	100	-88	P-SOP032-0525	
	12 520 k		RJ21Y3BA0ET	○ (22 fps VGA movie)	4 040 x 3 032	1.88 x 1.88	105			
1/2.33 type	10 550 k		★RJ23W3BA0KT	○ (28 fps VGA movie)	3 704 x 2 784	1.66 x 1.66	100	-85	N-LCC040-S433A	
			★RJ23W3CA0KT	-						
1/2.5 type	5 190 k		RJ23S3BE0BT	○	2 600 x 1 944	2.2 x 2.2	130	-88	P-SOP028-0400	
			RJ23S3CE0BT	-						
	6 360 k		RJ23T3BC0BT	○	2 872 x 2 160	2.05 x 2.05	100			
			RJ23T3CC0BT	-						
	7 400 k		RJ23U3BC0BT	○	3 096 x 2 328	1.9 x 1.9	105			N-LCC040-S433A
			RJ23U3CC0BT	-						
			RJ23U3EA0KT	○						
			RJ23U3FA0KT	-						
	8 500 k	RJ23V3BA0BT	○	3 320 x 2 496	1.75 x 1.75	100	P-SOP028-0400			
		RJ23V3CA0BT	-							
RJ23V3EA0KT		○								
RJ23V3FA0KT		-	N-LCC040-S433A							

■ 1/3-type CCDs

Total pixels	Standard	Model No.	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package			
			Horizontal TV lines	Image pixels (H x V)							
270 k	Color	RJ2311AA0PB	330	512 x 492	9.6 x 7.5	1 300	-120	P-DIP016-0500C			
		RJ2311BA0PB				2 000	-130				
320 k		PAL		RJ2321AA0PB	512 x 582	9.6 x 6.3	1 300		-120		
				RJ2321BA0PB			9.6 x 6.34		2 000	-130	
410 k		NTSC		RJ2351AA0BB	480	768 x 494	6.4 x 7.5		800	-105	N-DIP016-0450
				RJ2351BA0AB					1 500	-120	
470 k	PAL	RJ2361AA0BB	752 x 582	6.5 x 6.3	750	750	-105				
		RJ2361BA0AB				6.53 x 6.39	1 500	-120			

★Under development



■ 1/3.8-type CCD

Total pixels	Standard		Model No.	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
				Horizontal TV lines	Image pixels (H x V)				
290 k	Color	NTSC	★RJ2411CA0PB*	330	532 x 512	7.2 x 5.6	1 200	-120	P-DIP014-0400A

* Suitable for intense light exposure.

■ 1/4-type CCDs

Total pixels	Standard		Model No.	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package		
				Horizontal TV lines	Image pixels (H x V)						
270 k		NTSC	RJ2411AA0PB*	330	512 x 492	7.2 x 5.6	800	-105	P-DIP014-0400A		
			RJ2411AB0PB				1 200	-120			
			RJ2411BA0PB*								
			RJ2411BB0PB								
320 k	Color	PAL	RJ2421AB0PB	512 x 582	7.2 x 4.7	720	-105				
			RJ2421BB0PB		7.2 x 4.73	1 100	-120				
410 k		NTSC	RJ2451AA0PB	480	768 x 494	4.9 x 5.6	400	-90			
			RJ2451BA0PB				600	-114			
470 k		PAL	RJ2461AA0PB				752 x 582	5.0 x 4.7		400	-90
			RJ2461BA0PB					5.0 x 4.77		600	-114

* Suitable for intense light exposure.

■ 1/3-type CCDs with Dual-power-supply (5 V/12 V) Operation

Total pixels	Standard		Model No.	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
				Horizontal TV lines	Image pixels (H x V)				
270 k	B/W	EIA	LZ2316B3	380	512 x 492	9.6 x 7.5	4 500*	-120	N-DIP016-0500C
320 k		CCIR	LZ2326B2		512 x 582				

* When IR cut-off filter is not used.

■ CCD Peripheral ICs/LSIs

Description	Model No.	Features		Package
Single-chip driver (Timing generator + Synchronous signal generator)	LR385851	For 270-k/320-kpixel CCDs with dual-power-supply operation (5 V/12 V)	Electronic shutter, electronic exposure, mirror image function, for B/W CCDs, level shifter, smooth shutter, line lock function	P-QFP048-0707
Signal processor	IR3Y30M2	Available for signal processing from CCD output to 75 Ω video output, for B/W CCDs, comparator for electronic exposure, high-speed S/H circuit, H aperture, LPF, AGC		P-QFP048-0707
V driver	LR366851	Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter		P-SSOP024-0275
	LR36687U	Vertical pulse driver for CCDs, 2-level output x 10, 3-level output x 10, 2-level output circuit for electronic shutter		P-VQFN064-0808
	LR36689U	Vertical pulse driver for CCDs, 2-level output x 4, 3-level output x 8, 2-level output circuit for electronic shutter		P-VQFN036-0505
CDS/PGA/ADC	IR3Y48B1	Low power consumption [80 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC (18 MHz), 10-bit digital output		P-QFP048-0707
	IR3Y60U6	Low power consumption [69 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC (20 MHz), 10-bit digital output		P-VQFN032-0505
	IR3Y50U6	Low power consumption [75 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC (25 MHz), 12-bit digital output		P-VQFN036-0606
Timing generator + V driver + CDS/PGA/ADC	LR38667	For 1/2.5-type 5 190-kpixel CCDs with/without movie function	<Timing generator> Monitoring mode/still mode <V driver> Vertical pulse driver for CCDs, 2-level output x 10, 3-level output x 10, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 30 MHz (LR38667)/ 36 MHz (LR38675/LR38678), high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC, 12-bit digital output	LFBGA192-1010
	LR38675	For 1/2.5-type 6 360-kpixel CCDs with/without movie function		
	LR38678	For 1/2.5-type 7 400-kpixel CCDs with/without movie function		
	★LR36B11A	For 1/2.5-type 5 190-kpixel, 6 360-kpixel, 7 400-kpixel, 8 500-kpixel CCDs with/without movie function, For 1/1.8-type 8 500-kpixel, 1/1.7-type 10 540-kpixel, 12 520-kpixel CCDs with movie function	<Timing generator> Programmable timing generator <V driver> Vertical pulse driver for CCDs, 2-level output x10, 3-level output x10 2-level output circuit for electronic shutter <CDS/PGA/ADC> 40 MHz, high-speed S/H circuit, high-gain PGA circuit, 22-bit ADC, 16-bit digital output	LFBGA140-0909
V driver + CDS/PGA/ADC + DSP	LR386431/33	For 270-k/320-k/410-k/ 470-kpixel CCDs	<V driver> Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 2, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 18 MHz, high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC <DSP> 9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, mirror image function, YUV digital output, NTSC/PAL analog output	LFBGA168-1212/ LFBGA171-0811
	LR38653		<V driver> Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 2, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 25 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, YUV digital output, NTSC/PAL analog output	LFBGA171-0811

☆New product
★Under development



■ CCD Peripheral ICs/LSIs (cont'd)

Description	Model No.	Features	Package
V driver + CDS/PGA/ADC + DSP	LR38654	For 270-k/290-k/320-k/410-k/ 470-kpixel CCDs <V driver> Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 2, 2-level output circuit for electronic shutter <CDS/PGA/ADC> 25 MHz, high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC <DSP> 10-bit DAC, synchronous signal generation circuit, built-in CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, electronic optical axis adjustment function*1, YUV digital output, NTSC/PAL analog output	LFBGA171-0811
DSP	LR386032	9-bit DAC, synchronous signal generation circuit, built-in CCD drive timing generator, AE control function, AWB control function, mirror image function, YUV digital output, NTSC/PAL analog output	P-LQFP080-1212
	LR386071	9-bit DAC, synchronous signal generation circuit, built-in CCD drive timing generator, AE control function, AWB control function, mirror image function, YUV digital output, NTSC/PAL analog output, Y/C separation analog output, line lock function	P-LQFP100-1414
	LR38627	For 270-k/320-k/410-k/ 470-kpixel CCDs 10-bit DAC, synchronous signal generation circuit, built-in CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto white blemish compensation function, mirror image function, YUV digital output, NTSC/PAL analog output	P-TQFP128-1414
	★LR38690	10-bit DAC, synchronous signal generation circuit, built-in CCD drive timing generator, AE control function, AWB control function, lens shading correction function, auto blemish compensation function, mirror image function, mechanical iris control function, privacy masking function, Day/Night control function, color rolling suppression function, high resolution function, NTSC/PAL analog output, Y/C analog output, UYVY digital output (ITU-R BT656 compliant)	P-LQFP100-1414
Buffer IC for CCD output circuit	☆IR3T47G	For 5 190-kpixel to 12 520-kpixel CCDs Input voltage range: 11.5 to 16 V, Constant current range: 1 to 5.75 mA, ON/OFF control for constant current	B-VQFN8 (1.50 mm x 1.50 mm)
Power supply IC for CCDs and peripheral ICs/LSIs	IR3M55U*2	For 270-k/320-kpixel CCDs Input voltage range: 4.5 to 16 V, PWM control + charge pump system, output voltage: three outputs (15 V/12 V, -8 V/-5 V, 3.3 V), power sequencing circuit, overcurrent protection circuit	P-VQFN032-0505
	IR3M59U		
	IR3M61U*2	For 270-k/290-k/320-k/410-k/ 470-kpixel CCDs Input voltage range: 4.5 to 10 V, PWM control + charge pump system, output voltage: four outputs (15 V, -8 V, 3.3 V, 1.8 V), power sequencing circuit, overcurrent protection circuit	
	IR3M63U		

*1 Only support for 290-kpixel CCD.

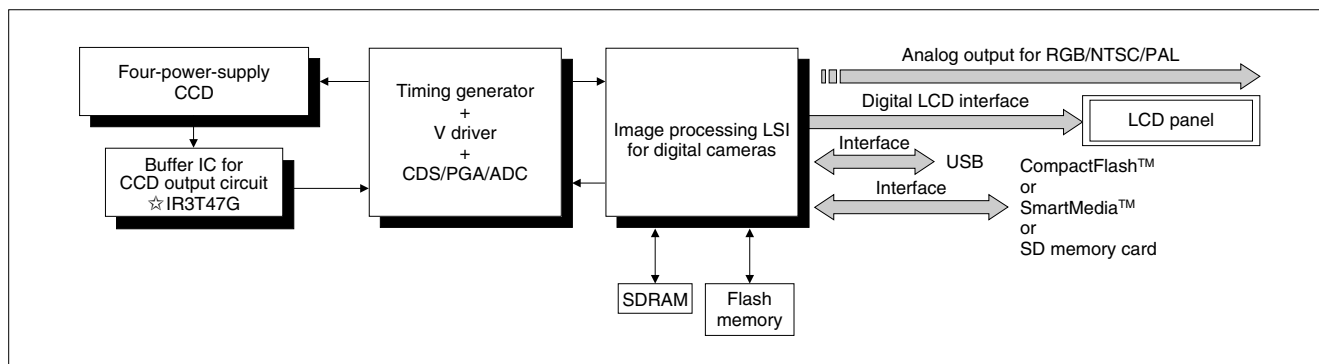
*2 For in-vehicle use

☆New product
★Under development



●System Configuration Examples

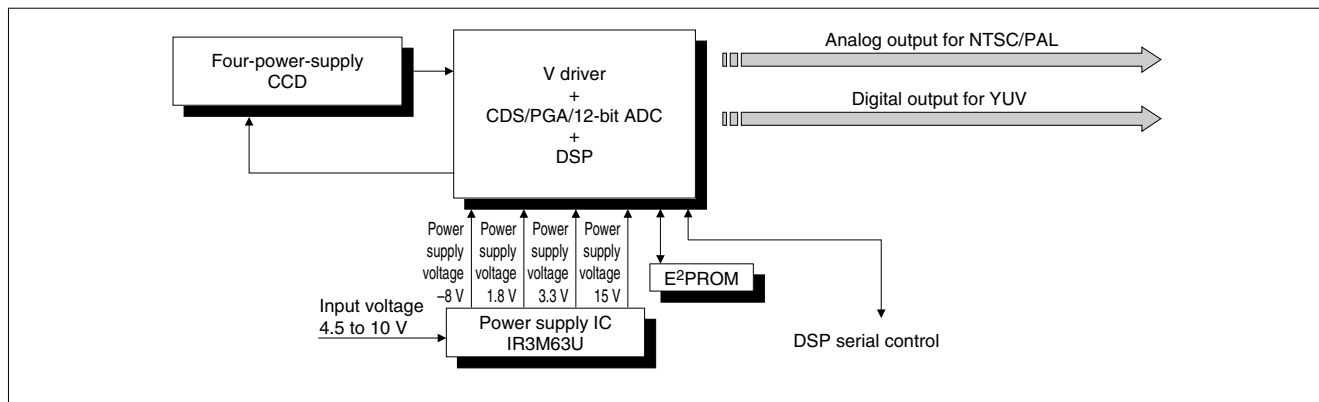
• High-resolution Digital Camera System with Three-chip Configuration



Four-power-supply CCDs and peripheral IC/LSIs

CCD		30 fps VGA movie		Buffer IC for CCD output circuit	Timing generator + V driver + CDS/PGA/ADC
1/1.7 type	10 540 k pixels	RJ21W3BC0ET	○ (25 fps VGA movie)	☆IR3T47G	★LR36B11A
	12 520 k pixels	RJ21Y3BA0ET	○ (22 fps VGA movie)		★LR36B11A + LR366851
1/2.33 type	10 550 k pixels	★RJ23W3BA0KT	○ (28 fps VGA movie)		★LR36B11A
		★RJ23W3CA0KT	-		LR38667/★LR36B11A
1/2.5 type	5 190 k pixels	RJ23S3BE0BT	○		LR38675/★LR36B11A
		RJ23S3CE0BT	-		LR38678/★LR36B11A
	6 360 k pixels	RJ23T3BC0BT	○		★LR36B11A
		RJ23T3CC0BT	-		
	7 400 k pixels	RJ23U3BC0BT	○		
		RJ23U3CC0BT	-		
		RJ23U3EA0KT	○		
		RJ23U3FA0KT	-		
	8 500 k pixels	RJ23V3BA0BT	○		
		RJ23V3CA0BT	-		
RJ23V3EA0KT		○			
RJ23V3FA0KT		-			

• Color Security Camera System with Two-chip Configuration [Low Power Consumption Type]

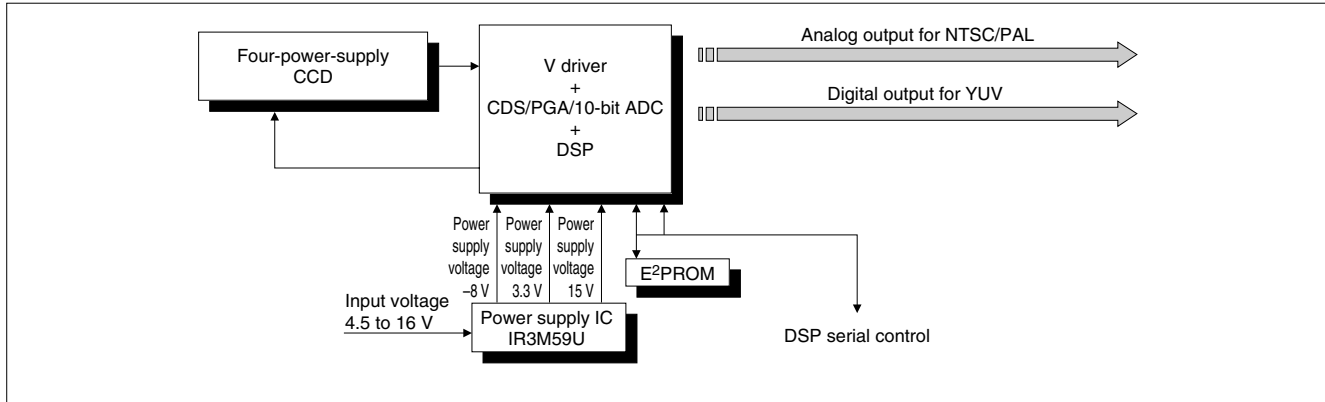


Four-power-supply CCDs and peripheral IC/LSIs

CCD			V driver + CDS/PGA/ADC + DSP	Power supply IC
1/3 type	270 k pixels	RJ2311AA0PB	LR38653/LR38654	—
		RJ2311BA0PB		
	320 k pixels	RJ2321AA0PB		
		RJ2321BA0PB		
	410 k pixels	RJ2351AA0BB		IR3M63U
		RJ2351BA0AB		—
470 k pixels	RJ2361AA0BB	LR38654	IR3M63U	
	RJ2361BA0AB			
1/3.8 type	290 k pixels	★RJ2411CA0PB	LR38654	IR3M63U
1/4 type	270 k pixels	RJ2411AA0PB	LR38653/LR38654	IR3M63U
		RJ2411AB0PB		
		RJ2411BA0PB		
		RJ2411BB0PB		
	320 k pixels	RJ2421AB0PB		—
		RJ2421BB0PB		
	410 k pixels	RJ2451AA0PB		IR3M63U
		RJ2451BA0PB		—
	470 k pixels	RJ2461AA0PB		IR3M63U
		RJ2461BA0PB		



• Color Security Camera System with Two-chip Configuration

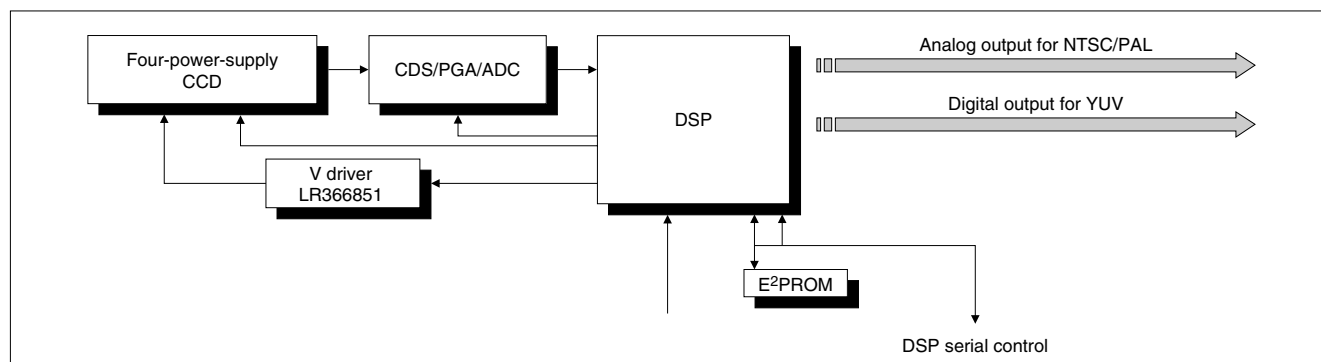


Four-power-supply CCDs and peripheral IC/LSIs

CCD		V driver + CDS/PGA/ADC + DSP	Power supply IC
1/3 type	270 k pixels	RJ2311AA0PB	—
		RJ2311BA0PB	
	320 k pixels	RJ2321AA0PB	
		RJ2321BA0PB	
	410 k pixels	RJ2351AA0BB	
		RJ2351BA0AB	
470 k pixels	RJ2361AA0BB		
	RJ2361BA0AB		
1/4 type	270 k pixels	RJ2411AA0PB	IR3M59U
		RJ2411AB0PB	
		RJ2411BA0PB	
		RJ2411BB0PB	
	320 k pixels	RJ2421AB0PB	
		RJ2421BB0PB	
	410 k pixels	RJ2451AA0PB	
		RJ2451BA0PB	
	470 k pixels	RJ2461AA0PB	
		RJ2461BA0PB	



• Color Security Camera System with Four-chip Configuration (I)



Four-power-supply CCDs and peripheral ICs/LSIs (1)

CCD		V driver	CDS/PGA/ADC	DSP
1/3 type	270 k pixels	RJ2311AA0PB	LR366851	IR3Y60U6 + LR386071, IR3Y48B1 + LR386032, IR3Y48B1 + LR386071
		RJ2311BA0PB		
	320 k pixels	RJ2321AA0PB		
		RJ2321BA0PB		
	410 k pixels	RJ2351AA0BB		
		RJ2351BA0AB		
470 k pixels	RJ2361AA0BB			
	RJ2361BA0AB			
1/4 type	270 k pixels	RJ2411AB0PB		
		RJ2411BB0PB		
	320 k pixels	RJ2421AB0PB		
		RJ2421BB0PB		
	410 k pixels	RJ2451AA0PB		
		RJ2451BA0PB		
	470 k pixels	RJ2461AA0PB		
		RJ2461BA0PB		

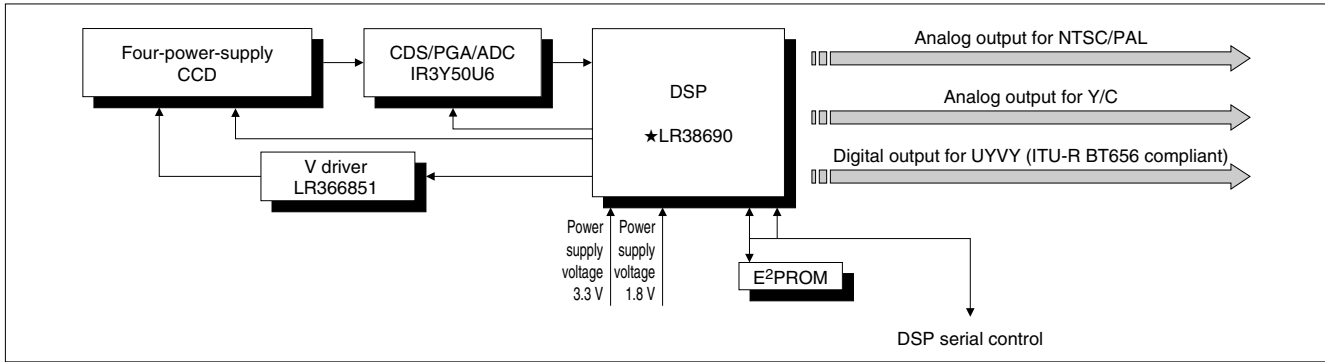
Four-power-supply CCDs and peripheral ICs/LSIs (2)

CCD		V driver	CDS/PGA/ADC	DSP
1/3 type	270 k pixels	RJ2311AA0PB	LR366851	IR3Y50U6
		RJ2311BA0PB		
	320 k pixels	RJ2321AA0PB		
		RJ2321BA0PB		
	410 k pixels	RJ2351AA0BB		
		RJ2351BA0AB		
470 k pixels	RJ2361AA0BB			
	RJ2361BA0AB			
1/4 type	270 k pixels	RJ2411AB0PB		
		RJ2411BB0PB		
	320 k pixels	RJ2421AB0PB		
		RJ2421BB0PB		
	410 k pixels	RJ2451AA0PB		
		RJ2451BA0PB		
	470 k pixels	RJ2461AA0PB		
		RJ2461BA0PB		
				LR38627

★Under development



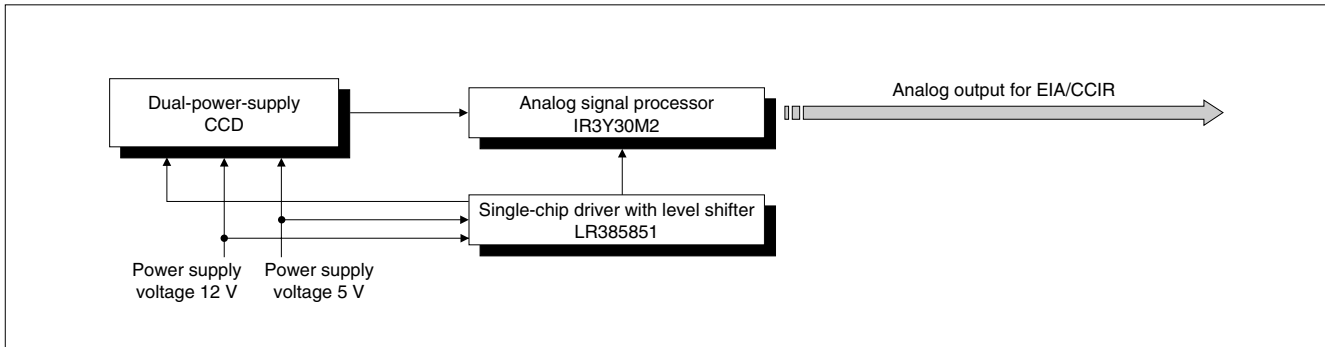
• Color Security Camera System with Four-chip Configuration (II)



Four-power-supply CCDs and peripheral ICs/LSIs

CCD		V driver	CDS/PGA/ADC	DSP
1/3 type	270 k pixels	RJ2311AA0PB	IR3Y50U6	★LR38690
		RJ2311BA0PB		
	320 k pixels	RJ2321AA0PB		
		RJ2321BA0PB		
	410 k pixels	RJ2351AA0BB		
		RJ2351BA0AB		
470 k pixels	RJ2361AA0BB			
	RJ2361BA0AB			
1/4 type	270 k pixels	RJ2411AB0PB		
		RJ2411BB0PB		
	320 k pixels	RJ2421AB0PB		
		RJ2421BB0PB		
	410 k pixels	RJ2451AA0PB		
		RJ2451BA0PB		
	470 k pixels	RJ2461AA0PB		
		RJ2461BA0PB		

• B/W Security Camera System



Dual-power-supply CCDs and peripheral IC/LSI for analog interface

CCD		Single-chip driver (Timing generator + Synchronous signal generator)	Signal processor
1/3 type	270 k pixels	LR385851	IR3Y30M2
	320 k pixels		



■ For Notebook PCs, PC Monitors and LCD TVs

● TFT-LCD Drivers

Drive function	Model No.	Gray scale	No. of LCD drive outputs	Display voltage (V) MAX.	Clock frequency (MHz) MAX.	Supply voltage (V)	Description	Package
Source driver	Dot inversion drive	LH16AM	64 levels	384	13.5	85	Low EMI*1 driver using RSDS™*2 interface, built-in reference voltage generation circuit, R-DAC system	SOF
		LH16B6		402/414/420/432				
		LH16AD		480/504/516/528				
		LH16B5		630/642				
		LH16B9		684/690/702/720				
		LH16B4	256 levels	384	15	2.7 to 3.6	Low EMI*1 driver using PPDS™*3 interface, C-DAC system	
		LH16BZ	384/414/420	16.5				
		LH16AF	480	15				
		LH16BD	1 024 levels	414	16	250		
Gate driver	LH1694	—	256	42	0.1	2.7 to 3.6	Output signal masking function, usable with both positive/negative power supplies, enables chain connection	TCP/SOF
	LH169J		200/240/256/263/270	45	0.2	2.4 to 4.2	Output signal masking function, enable constructing the module without substrate	SOF

*1 EMI: Electro-Magnetic Interference

*2 RSDS™: Reduced Swing Differential Signaling

*3 PPDS™: Point to Point Differential Signaling

■ For Mobile Equipment
● TFT-LCD Drivers

Drive function		Model No.	Gray scale	No. of LCD drive outputs	Display voltage (V) MAX.	Clock frequency (MHz) MAX.	Supply voltage (V)	Description	Package
Source driver	Dot inversion drive	LH16AV	64 levels	402/480/516	13.5	65	2.7 to 3.6	Built-in reference voltage generation circuit, R-DAC system, power saving function	COG
	Line inversion drive	LH168Y		240	5.5	35	2.5 to 5.5	Built-in reference voltage generation circuit, R-DAC system, power saving function, polarity inversion of input data	
		LH16AR		480			2.5 to 3.6	Built-in R-DAC system, power saving function, polarity inversion of input data	
		LH1687	Analog	240	12.5	3.0 to 5.5	Selectable three-point simultaneous or normal sampling (Sampling frequency : 25 MHz), power saving function, 3 V drive (MIN.), prechargeless output	TCP/SOF/COG	
Gate driver		LH1691	-	240	33	0.1	Selectable 1-pulse (normal) or 2-pulse (continuous/jumping) scanning, usable with both positive/negative power supplies	COG	
		★LH169H		240/244/258	40		2.5 to 3.6		Output signal masking function, enables chain connection

● STN-LCD Drivers

Drive technology	Drive function	Model No.	No. of LCD drive outputs	Duty ratio	Display voltage (V) MAX.	Data input	Clock frequency (MHz) MAX.	Supply voltage (V)	Package
New drive technology*1	Segment	LH1583	160	to 1/240	+5.5	4/8-bit parallel	12 (at 2.4 V)/ 20 (at 5 V)	2.4 to 5.5	TCP/SOF
	Common	LH1537	200/240	1/200, 1/240	+45	-	3 (at 2.4 V)/ 4 (at 5 V)	2.4 to 5.5	
		LH1538	120/128	to 1/480	+80		3 (at 2.5 V)/ 4 (at 5 V)		
Conventional drive technology*2	Segment	LH1542	80	to 1/240	+30	4-bit parallel	8	2.5 to 5.5	
		LH1549	160	to 1/480	+42	4/8-bit parallel	12 (at 2.5 V)/ 20 (at 5 V)		
		LH1548	240			8/12-bit parallel	12 (at 2.5 V)/ 25 (at 5 V)		
	Common	LH1530	120	to 1/480	+42	-	3 (at 2.5 V)/ 4 (at 5 V)		
	Segment or Common (Pin-selectable)	LH1565	160	to 1/240	+30	4/8-bit parallel (at segment drive)	[Segment mode] 8 [Common mode] 4		
LH1560		8 (at 2.5 V)/ 14 (at 5 V)							
	LH1562	240	to 1/480	+42		[Segment mode] 12 (at 2.5 V)/ 20 (at 5 V) [Common mode] 4			

*1 New drive technology: A drive technology which drives LCDs with low voltage of 5 V on segment side and drives LCDs with high voltage on common side. Driving with low voltage on segment side enables LCDs to reduce power consumption and shadowing.

*2 Conventional drive technology: A drive technology which drives LCDs with high voltage on both segment and common sides.



■ For Mobile Phones

● TFT-LCD Controllers

Model No.	LCD interface (pixel) MAX.	Display colors MAX.	Display RAM capacity (bit)	Function	CPU interface	External image interface	Supply voltage (V)		Package
							Core	Host I/F	
LR388D1	240 x 400	262 144 colors	240 x 400 x 18	<ul style="list-style-type: none"> • MDDI* compliant • Built-in IrSimple™ and IrDA® communications functions • Main/sub LCD controller • Graphic processing 	MDDI* for MSM series/ 80-family (8/9/16/ 18-bit parallel)	-	1.65 to 1.95	1.65 to 3.6	VFBGA144-0808
LR38869A				<ul style="list-style-type: none"> • MDDI* compliant • Main/sub LCD controller • Graphic processing • Parallel bus host interface 					TFBGA176-0909
LR388D0		16 770k colors	-	<ul style="list-style-type: none"> • DAC type LCD controller • Built-in voltage generation circuit for LCD • Built-in common drive circuit • Built-in level shifter for panel control • Built-in timing generator 	-	RGB : respective 8-bit parallel	VFBGA144-0808		

* MDDI (Mobile Display Digital Interface) : The serial interface standard developed by QUALCOMM.

● TFT-LCD Driver

Model No.	No. of LCD drive outputs	LTPS*	Function	External image interface	Supply voltage (V)		Package
	Source				Display MAX.		
LH16AP	240	○	<ul style="list-style-type: none"> • Built-in timing generator, DC-DC converter, VCOM generation circuit 	RGB : respective 6-bit parallel	2.2 to 3.6	5.5	COG/SOF

* LTPS : Low Temperature Poly-Silicon



●Color STN-LCD Controllers/Drivers

Display colors MAX.	Drive function	Model No	No. of LCD drive outputs		Display RAM capacity (bit)	Duty ratio	Display voltage (V) MAX.	Data input	Clock frequency (MHz) MAX.	Supply voltage (V)	Package
			Segment	Common							
256 colors	Segment and Common	LH15H1	288	66	96 x 66 x 8	1/10, 1/18, 1/26, 1/34, 1/42, 1/50, 1/58, 1/66	+13.2	8/16-bit parallel, serial	4 (at 3 V)	1.8 to 3.3	TCP/SOF
65 536 colors		LH15KA	396	176	132 x 176 x 16	to 1/176 (Selectable per 1 line)	+18.6	8/16-bit parallel, serial	4 (at 3 V)	1.8 to 3.3	COG
262 144 colors		LH15LA		162	132 x 162 x 18	to 1/162 (Selectable per 1 line)	±18		6.25 (at 1.65 to 1.95)	Core : 1.65 to 1.95 Host I/F : 1.65 to 3.6	COG

●Color STN-LCD Controller

Model No.	LCD interface (pixel) MAX.	Display colors MAX.	Function/Feature	CPU interface	Display RAM capacity (bit)	Supply voltage (V) TYP.	Package
LR38844A	128 x 164	65 536 colors	<ul style="list-style-type: none"> High-speed host access Display colors selectable : 256/4 096/65 536 colors Power saving function reduces the power consumption in standby mode Built-in CPU interface, LCD interface, clock generator, display memory 	Recommended to be used together with LH15H1	68-family/ 80-family (8/16 bits)	2.5	TFBGA081-0808



■ Peripheral ICs for LSIs for LCDs

● Video Interface ICs for TFT-LCDs

Model No.	Input signal					Color decode	LCD panel				Serial data control	Supply voltage (V) TYP.	Power consumption (mW) TYP.	Package
	Com-posite video	Y/color difference	Analog RGB	Digital RGB	OSD (Digital)		±power source	+power source	Low voltage source	Digital input				
IR3Y18A1	○				○	NTSC/PAL	○	○				4.5/12 or 4.5/-7.5	130	P-QFP048-0707
IR3Y26A2/A6			○*3			-			○			5/7.5	140	P-QFP048-1010/ P-QFP048-0707
IR3Y29A1/B1	○		○			NTSC/PAL			○				190	P-QFP048-0707
IR3Y31M1	○		○			NTSC/PAL	○	○			4.5/12 or 4.5/-7.5	160		
IR3Y37A1		○ (Common terminal)			○	-			○		3/6.5	106/88*6		
RB5P0010M2			○*3		○	-	○	○		○	3/12 or 3/4.5/-7.5	92		
RB5P0020M2		○ (Common terminal)			○	-			○		3/5	70/57*6	P-QFP048-1010	
RB5P0050M2		○ (Common terminal)			○	-			○	○		95/80*6		
RB5P0060M2	○		○			NTSC/PAL			○	○	3/5/13	120		
RB5P006AM2	○		○			NTSC/PAL			○	○				
RB5P0070M*1	○		○		○	NTSC/PAL				○	3/7	330	P-QFP072-1010	
RB5P0090M	○		○*3			NTSC/PAL (automatic identification)			○		○	5/13	250	P-QFP048-1010
IR3Y63M*2	○	○	○	○	○ (Built-in)	NTSC/PAL/ SECAM			○		○*4	1.8/3/5	270	P-TQFP100-1414
IR3Y66M*2				○		NTSC/PAL			○		○*4		130	P-QFP072-1010
★IR3Y67M*1,2	○	○	○	○	○*7	NTSC/PAL/ SECAM				○	○*5	1.8/3	250	P-TQFP100-1414

*1 For digital signal input panels

*2 Built-in timing generator

*3 Two inputs

*4 Both 3-wire and I²C are available.

*5 Only for I²C

*6 At analog input for RGB

*7 Both built-in OSD and external OSD are available.



●Power Supply ICs for TFT-LCDs

Model No.	Application/Function	Oscillation frequency (kHz)	Supply voltage (V)	Package
IR3M16U	For small TFT-LCD panels, charge pump system DC-DC converter (15.3 V, 5.1 V, -10.2 V)	100	2.6 to 3.6	P-HQFN020-0404
IR3M30U	For small/medium TFT-LCD panels, PWM switching system DC-DC converter (Output voltage (3ch) : External setting)	70 to 1 000	2.7 to 5.5	P-VQFN036-0505
IR3M58M/U		70 to 500	4.5 to 28	P-QFP048-0707/ P-VQFN036-0505

●Gray-scale ICs for TFT-LCDs

Model No.	Panel type	Function	No.of output circuits	Output current (mA) MAX.	Common output current (mA) MAX.	Supply voltage (V)	Package
IR3E2015	<ul style="list-style-type: none"> • Small panels • Line inversion drive 	γ correction, gray-scale voltage generator for LCD drive, built-in dividing resistors	10	± 1	± 1	4.5 to 5.5	P-MFP018
IR3E2045			5			4.6 to 5.5	P-SSOP012-0225/ P-HQFN020-0404
IR3E3XX*							
IR3E11P1	<ul style="list-style-type: none"> • Large panels • Dot inversion drive 	γ correction, gray-scale voltage generator for LCD drive	10	± 15	± 150	7 to 14	P-QFP048-0707
IR3E11A1						7 to 15	P-TQFP048-0707
IR3E11M1			7 to 14				
IR3E12M1			18			7 to 15	

* SHARP can offer semi-custom-made gray-scale ICs in accordance with the characteristics of LCD panels.



System LSIs

Model No.	Function	Features	Supply voltage (V)	Package
LR388D1	WQVGA LCD controller with a built-in IrSimple™ function based on MDDI*1	<ul style="list-style-type: none"> Built-in video memory : 240 x 400 pixels, 260 k colors (18 bits) MDDI*1 TYPE I compliant Supports 80-family CPU bus (8/9/16/18 bits) Built-in modulation and demodulation IP for IrSimple™, IrDA®, and IR remote controller Built-in graphic engine (built-in zoom, scroll functions, etc.) Supports dual displays for both main WQVGA and Sub CPU panels 	Core: 1.8 (TYP.) I/O: 1.8 to 3.3	VFBGA144-0808
LR388B6/B62	Control LSI for IrSimple™ and IrDA® communications	<ul style="list-style-type: none"> Transmitting function based on IrSimple™ and IrDA® specifications Built-in 4-kbyte buffer for both sending and receiving Sending function for IR remote controller Matches SHARP optical modules 	Core: 1.8 (TYP.) I/O: 1.8 to 3.3	TFBGA056-0808/ VFBGA057-0505
LR388B3	IrSS™ (IrSimpleShot™) receiving controller with JPEG decoder	<ul style="list-style-type: none"> Receiving controller and protocol based on IrSimple™ 1.0 uni-directional Profile (IrSS™) Built-in JPEG decoder Hi-resolution and standard video output interface Matches SHARP optical modules 	Core: 1.2 (TYP.) I/O: 3.3 (TYP.)	TFBGA180-1313
LR38888A	H. 264 decoder for one-seg digital terrestrial TV broadcasting	<ul style="list-style-type: none"> Built-in video (H. 264) and audio (MPEG2-AAC + SBR) decoding functions Low power consumption: 150 mW Fast play Built-in memory (DRAM) Input signal: MPEG2-TS Image size: QVGA Frame rate: 15 frames/s Output signal format: Image UYVY/RGB for video, I²S for audio Output interface: CPU bus, camera interface 	Core: 1.3 (TYP.) I/O: 1.8/3.3	TFBGA208-1010
LR35501/Y	Home & amusement processor	<ul style="list-style-type: none"> Capable of moving picture transmission/play, thanks to real-time image compression and extension technology Real images, backgrounds and sprites can be superimposed Built-in sprite processor Built-in color object detector Built-in Bluetooth® interface Built-in sound generator (ADPCM/PSG) Built-in CMOS camera module interface Built-in video encoder: NTSC/PAL composite signal output Analog RGB signal output CPU: Z80 compatible PIO, UART, SIO, NAND flash memory I/F, ADC, PWM, SPI, etc. 	Core: 1.8 ± 0.18 I/O: 3.3 ± 0.3	P-QFP128-1420/ TFBGA160-1212
LR38886	Image detection engine	<ul style="list-style-type: none"> High-speed image processing: 960 MOPS (MAX.) Built-in camera interface: 8-bit digital input (UYVY etc.), Can be connected to a camera directly, up to 4-million pixel camera Built-in SDRAM interface: 512 Mbits (MAX.) Universal I/O: 15 ports (MAX.) Serial interface (SPI) Bus interface (Bus Master) Built-in PLL (200 MHz (MAX.)) Automatic control of power consumption according to amount of data processed 	Core: 1.8 (TYP.) I/O: 3.3 (TYP.)	P-LQFP176-2424
LR388733	USB On-The-Go controller	<ul style="list-style-type: none"> USB2.0 supplemental standard OTG1.0 compliant Connectable to a product whose data transfer speed 12 Mbps and 1.5 Mbps Built-in 2-ch USB line driver (2-port root HUB function) Asynchronous SRAM-compatible interface Supports 4 transfer modes (control, bulk, interrupt and isochronous) 	Core: 3.3 (TYP.) I/O (USB): 3.3/5	P-QFP072-1010

*1 MDDI (Mobile Display Digital Interface): The serial interface standard developed by QUALCOMM



■ IrSimple™ Communications Series <LR388D1/LR388B3/LR388B6/LR388B62>

IrSimple™ Communications is a communications protocol which makes the Ir communication standard employed in mobile terminals such as mobile phones, IrDA® protocol, more efficient. Compared with IrDA®, since the data transfer time can be significantly reduced to approximately 1/4th to 1/10th, higher volumes of data can be sent and received. In addition, by incorporating the IrSimple™ function into mobile equipment or digital home appliances, high-quality image data taken with a digital camera or a mobile phone camera can be readily transferred to a TV or a printer at high speed with a simple operation such as with a remote controller. The image data captured from the camera can be enjoyed on full HD-TV, or by printing the data out.

● Features

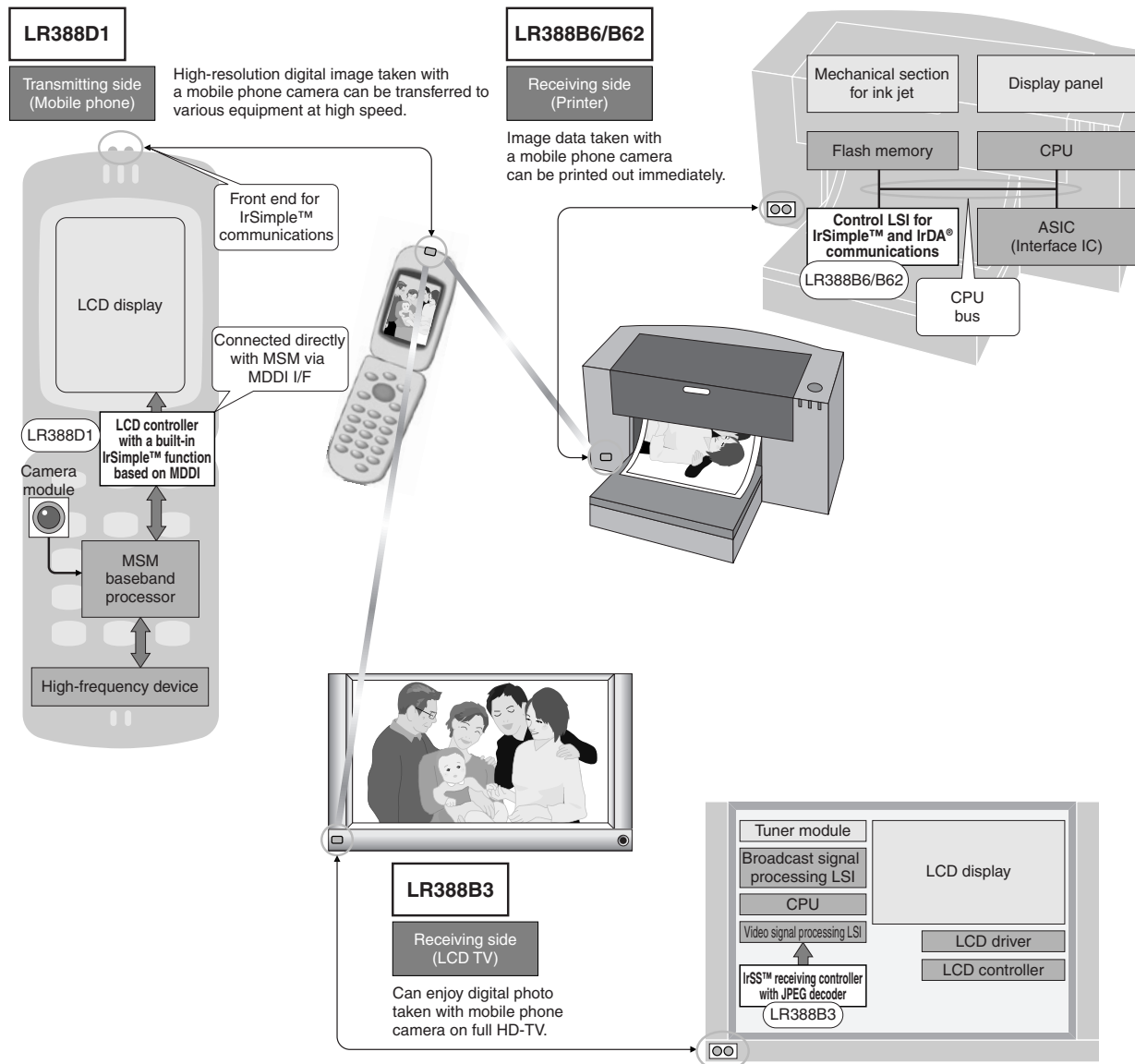
● LR388D1 (WQVGA LCD controller with a built-in IrSimple™ function based on MDDI*1)
 Thanks to a built-in IrSimple™ function in the LCD controller, the mounting area of a mobile phone can be decreased; thus it contributes to size reduction in mobile phones. Also, a higher volume of data can be transferred at high speed with 4 fewer signal lines due to the incorporation of an MDDI*1 interface.

● LR388B3 (IrSS™ receiving controller with JPEG decoder)
 Thanks to incorporation of a JPEG circuit, image data taken with a mobile phone can be received as JPEG compressed data via TV, and then the compressed image data can be displayed on TV.

● LR388B6/B62 (Control LSI for IrSimple™, IrDA®, IR remote controller)
 High-quality image data taken with a digital camera or a mobile phone camera can be readily transferred to a TV or a printer at high speed with a simple operation such as with a remote controller.

*1 MDDI (Mobile Display Digital Interface) : The serial interface standard developed by QUALCOMM.

● Application & System Configuration Example



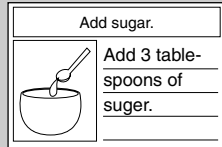


■ Home & Amusement Processor <LR35501/LR35501Y>

The LR35501/Y are LSIs with a built-in graphic engine, enabling smooth graphic display. In addition, various types of I/Os are incorporated, including analog RGB output which is required for LCD connection.

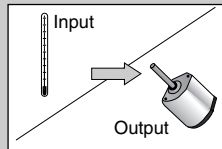
● Features

● Built-in versatile graphic functions



- Capable of moving picture transmission/play, thanks to real-time image compression and extension technology
- Real images, backgrounds and sprites can be superimposed
- Built-in sprite processor
- Built-in video encoder: NTSC/PAL composite signal output
- Analog RGB signal output

● Various I/O built-in



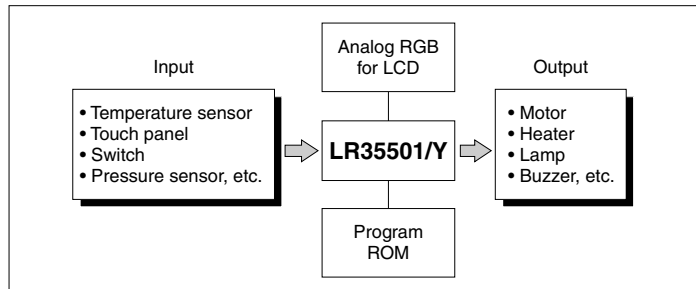
- Built-in sound generator (ADPCM/PSG)
- Built-in CMOS camera module interface
- General purpose I/Os (PIO, UART, SIO, NAND flash memory I/F, ADC, PWM, SPI, etc.)

● Linkable with mobile phones and PCs, etc.

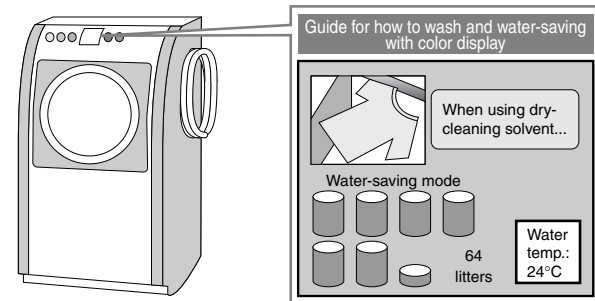
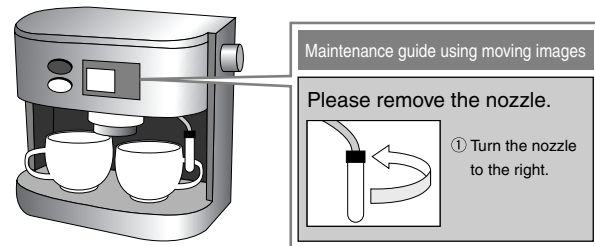
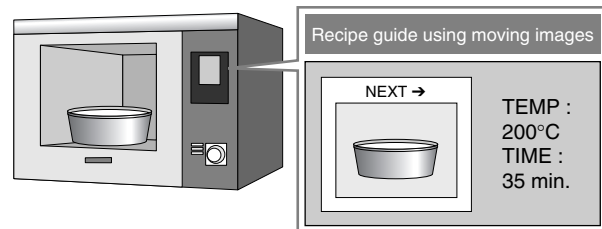


- Built-in Bluetooth® interface
- Capable of Ir communication

● System Configuration Example



● Application Examples





■ H.264 Decoder for One-Seg Digital Terrestrial TV Broadcasting <LR38888A>

The LR38888A is an H.264 decoder for one-seg digital terrestrial TV broadcasting, which started in April 2006 .
 For example, simple connection to the camera interface of an existing mobile phone system readily enables one-seg TV.

● Features

● Low-power technology facilitates long viewing times for terrestrial digital TV broadcasting on mobile equipment

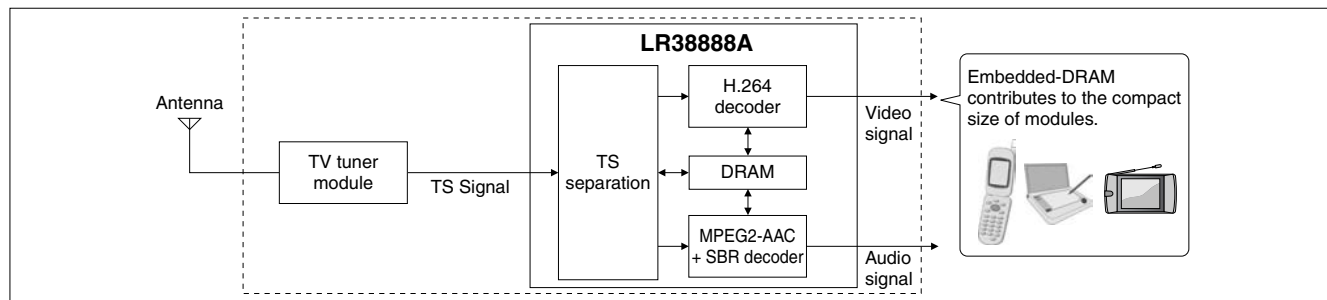
The LR38888A features low power consumption when viewing TV, based on a proprietary embedded media processing accelerator* and on-chip memory, making it possible to view TV for extended lengths of time on battery power.

*Hardware and software to improve functions and processing capabilities.

● Contributes to shorter development times for mobile equipment with a one-seg TV receiver

Built-in video and audio output interfaces enable this LSI to be readily designed into an existing mobile phone system, to provide TV viewing functions by supplying the firmware needed to view terrestrial digital TV broadcasting, contributing to shorter development times for mobile equipment with TV reception functions.

● Application & System Configuration Example





Smart Cards/LSI Modules for Smart Cards

Type	Communication standards	Protocol	Transmission speed (kbps) MAX.	Nonvolatile memory capacity	Cycling capability	CPU	Security system	
SJCard 211	Contact	ISO/IEC7816	T = 1	19.2	1 Mbyte (Flash memory)	100 000 times	16 bits	RSA, DES, T-DES, etc. high-speed cryptographic authentication with built-in coprocessor, hardware-based random number generator
	Contactless	ISO/IEC14443 Type B	ISO/IEC14443-4	424				
JCOP*	Contact	ISO/IEC7816	T = 0, 1	76.8	1 Mbyte (Flash memory)	100 000 times	16 bits	
	Contactless	ISO/IEC14443 Type B	ISO/IEC14443-4	424				
(Under development)	Contact	ISO/IEC7816	T = 0, 1	76.8	1 Mbyte (Flash memory)	100 000 times	32-bit MIPS	(Under development)
	Contactless	ISO/IEC14443 Type B	ISO/IEC14443-4	424				



SJ card211

- Java Card™ 2.1.1 compliance
- Capable of developing applications using Java language



JCOP* card

- Java Card™ 2.2 compliance
- GP (Global Platform) 2.1.1 compliance
- EMV 2000 compliance
- Capable of developing applications using Java language



★32-bit MIPS card

- With built-in 32-bit MIPS on CPU
- Security upgrades thanks to secure controller, MIPS32™ 4Ksd™

*JCOP : JCOP means IBM's Java Card Open Platform, which was developed by IBM Corporation as an embedded Operating System (OS) for smart cards which conforms to the standards of Java and Global Platform. This platform ensures the security of applications working on various mobile terminals, such as a USB key and a smart card suitable for multiple applications.

■ Reader/Writer for Smart Cards

Type	Model No.	Communication standard	Host interface	Transmission speed between smart card and RW (kbps)	Smart card operation method	Outline dimensions W x H x D (mm)	Mass (g)	Power supply
Contact type	RW-4040	ISO/IEC7816 (T = 0, 1)	USB1.1	9.6 to 153.6	Manual insertion/ Manual ejection	70.4 x 14.1 x 60.5	Approx. 65	DC 5 V (USB connector)
	RW-4020 (LR550R03)	ISO/IEC7816 (T = 0, 1)	PC card interface Type II	10.8 to 344.1		54 x 5 x 85.6	Approx. 30	DC 5 V (PC card connector)



Contact type reader/writer
RW-4040

- High-speed data communication
- Conforms to PC/SC standard
- USB interface



Contact type reader/writer
RW-4020 (LR550R03)

- High-speed data communication
- PC card interface Type II

■ SDK (Software Development Kit) for Smart Cards

SDK type	Contents
For SJCard 211	Development kit CD for SJCard SJCard simulator Contact type reader/writer (1 set)
For JCOP	Development kit CD for JCOP31id Card



Highly Functional Flash Memories

● Boot Block Type 3 V Page Mode Flash Memories: LH28FXXXBF Series

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
64 M	x 16	4 Kwords x 8, 32 Kwords x 127	Top boot	-40 to 85	LH28F640BFH-PTTL	<ul style="list-style-type: none"> Built-in dual work function Built-in OTP function [4 words (factory area) + 4 words (user area)]
			Bottom boot	-40 to 85	LH28F640BFH-PBTL	
128 M	x 16	4 Kwords x 8, 32 Kwords x 255	Top boot	-40 to 85	LH28F128BFH-PTTL	
			Bottom boot	-40 to 85	LH28F128BFH-PBTL	

Standard Flash Memories

● Boot Block Type 3 V Flash Memories: LH28FXXXBJ Series

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
8 M	x 8/ x 16	4 Kwords x 8, 32 Kwords x 15 (or 8 Kbytes x 8, 64 Kbytes x 15)	Top boot	0 to 70	LH28F800BJ-PTTL	<ul style="list-style-type: none"> Built-in OTP function [4 words (factory area) + 3 963 words (user area)]
				-40 to 85	LH28F800BJH-PTTL	
			Bottom boot	0 to 70	LH28F800BJ-PBTL	
				-40 to 85	LH28F800BJH-PBTL	
16 M	x 8/ x 16	4 Kwords x 8, 32 Kwords x 31 (or 8 Kbytes x 8, 64 Kbytes x 31)	Top boot	-40 to 85	LH28F160BJH-PTTL	-
			Bottom boot	-40 to 85	LH28F160BJH-PBTL	

Flash Memories/
Combination Memories



Fast-Reprogramming System-Flash for Digital Equipment

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
16 M	x 16	4 Kwords x 8 + 32 Kwords x 1, 64 Kwords x 15	Top boot	-40 to 85	LHF00L24	<ul style="list-style-type: none"> • Fast-programming (4-Kword blocks) • Built-in OTP function [4 words (factory area) + 4 words (user area)]
					LHF00L28	
			Bottom boot	-40 to 85	LHF00L25	
					LHF00L29	
32 M	x 16	4 Kwords x 8 + 32 Kwords x 1, 64 Kwords x 31	Top boot	-40 to 85	LHF00L08	
					LHF00L10	
					LHF00L14	
			Bottom boot	-40 to 85	LHF00L09	
					LHF00L11	
					LHF00L15	

System-Flash for Amusement Products

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
32 M	x 16	4 Kwords x 8 + 32 Kwords x 1, 64 Kwords x 31	Top boot	0 to 70	LHF00L34	• 44 SOP industry standard package
64 M	x 16	4 Kwords x 8, 32 Kwords x 127	Top boot	0 to 70	LH28F640BF-PTTL	• 44 SOP industry standard package
256 M	x 16	16 Kwords x 4, 64 Kwords x 255	Top boot	0 to 85	LH28F256BF-PTSL	• 70 SSOP industry standard package
512 M	x 16	(16 Kwords x 4, 64 Kwords x 255) x 2	Top/Top boot	0 to 70	LH28F512BFBD-PTSL	• Compact FBGA (CSP) package
				0 to 85	LH28F512BFND-PTSL	• 70 SSOP industry standard package



System-Flash for Automotive Use

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
32 M	x 16	4 Kwords x 8, 32 Kwords x 63	Top boot	-40 to 85	LH28F320BFH-PTTL	<ul style="list-style-type: none"> • Employs copper frame
64 M	x 16	4 Kwords x 8, 32 Kwords x 127	Top boot	-40 to 85	LH28F640BFH-PTTL	
			Bottom boot		LH28F640BFH-PBTL	
128 M	x 16	4 Kwords x 8, 32 Kwords x 255	Top boot	-40 to 85	LH28F128BFH-PTTL	
	x 16	(4 Kwords x 8, 32 Kwords x 127) x 2	Top/Bottom boot		LH28F128BFH-PWTL	
256 M	x 16	(4 Kwords x 8, 32 Kwords x 255) x 2	Top/Top boot	-40 to 85	LH28F256BFH-PTTL	

System-Flash for Network Equipment

Capacity (bit)	Bit configuration	Erasable block size		Operating temp. (°C)	Model No.	Remarks
64 M	x 8/ x 16	64 Kwords x 64 or 128 Kbytes x 64	Symmetrical block	-40 to 85	LH28F640SPH-PL	• 56 TSOP industry standard package
128 M	x 8/ x 16	64 Kwords x 128 or 128 Kbytes x 128	Symmetrical block	-40 to 85	LH28F128SPH-PTL	• 56 TSOP industry standard package



Highly Functional Flash Memories Boot Block Type 3 V Page Mode Flash Memories: LH28FXXXBF Series

Supply voltage		64 M : $V_{CC} = 2.7$ to 3.6 V, $V_{PP} = 1.65$ to 3.6 V or 9.0 to 10.0 V 128 M : $V_{CC} = 2.7$ to 3.6 V, $V_{PP} = 2.7$ to 3.6 V or 9.0 to 10.0 V								
Capacity (bit)	Bit configuration	Erasable block size		Model No.	Access time (ns) MAX.	Page mode access time (ns) MAX.	Read current (mA) MAX. $f = 5$ MHz (CMOS)	Standby current (μ A) MAX. (CMOS)	Operating temp. ($^{\circ}$ C)	Package
64 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 127	Top boot	LH28F640BFHE-PTTLHFA	70	30	25	20	-40 to 85	P-TSOP048-1220 (Normal bend)
			Bottom boot	LH28F640BFHG-PTTL70A						TFBGA048-0808
128 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 255	Top boot	LH28F128BFHT/B-PTTL75A	75	25	35	40		P-TSOP048-1220 (Normal bend)/TFBGA048-0808
			Bottom boot	LH28F128BFHT/B-PBTL75A						P-TSOP056-1420 (Normal bend)/LFBGA072-0811

Contact a SHARP sales office for other packages and top boot/bottom boot models other than those listed above.

Standard Flash Memories Boot Block Type 3 V Flash Memories: LH28FXXXBJ Series

Supply voltage		$V_{CC} = 2.7$ to 3.6 V, $V_{CCW} = 2.7$ to 3.6 V or 11.7 to 12.3 V										
Capacity (bit)	Bit configuration	Erasable block size		Model No.	Access time (ns) MAX.	Read current (mA) MAX. $f = 5$ MHz (CMOS)	Standby current (μ A) MAX. (CMOS)	Operating temp. ($^{\circ}$ C)	Package			
8 M	x 8/ x 16	Boot : 4 Kwords (8 Kbytes) x 2 Parameter : 4 Kwords (8 Kbytes) x 6 Main : 32 Kwords (64 Kbytes) x 15	Top boot	LH28F800BJE-PTTL90	90	25	15	0 to 70	P-TSOP048-1220 (Normal bend)			
			Bottom boot	LH28F800BJHE-PTTL90				-40 to 85				
			16 M	x 8/ x 16	Boot : 4 Kwords (8 Kbytes) x 2 Parameter : 4 Kwords (8 Kbytes) x 6 Main : 32 Kwords (64 Kbytes) x 31	Top boot	LH28F160BJHE-PTTL70	70		25	15	-40 to 85
						Bottom boot	LH28F160BJHE-PBTL70					-40 to 85

Contact a SHARP sales office for other packages and top boot/bottom boot models other than those listed above.



■ Fast-Reprogramming System-Flash for Digital Equipment

Supply voltage		$V_{CC} = 2.7$ to 3.6 V, $V_{PP} = 11.7$ to 12.3 V								
Capacity (bit)	Bit configuration	Erasable block size		Model No.	Access time (ns) MAX.	4-Kword programming time (s)	Read current (mA) MAX. f = 5 MHz (CMOS)	Standby current (μ A) MAX. (CMOS)	Operating temp. ($^{\circ}$ C)	Package
16 M	x 16	Parameter : 4 Kwords x 8 + 32 Kwords x 1 Main : 64 Kwords x 15	Top boot	LHF00L24	70	0.31	17	10	-40 to 85	TFBGA048-0608
				LHF00L28						P-TSOP048-1220 (Normal bend)
			Bottom boot	LHF00L25	70	0.31	17	10	-40 to 85	TFBGA048-0608
				LHF00L29						P-TSOP048-1220 (Normal bend)
32 M	x 16	Parameter : 4 Kwords x 8 + 32 Kwords x 1 Main : 64 Kwords x 31	Top boot	LHF00L08	90	0.31	17	10	-40 to 85	TFBGA048-0608
				LHF00L10						TFBGA048-0707
				LHF00L14						P-TSOP048-1220 (Normal bend)
			Bottom boot	LHF00L09	90	0.31	17	10	-40 to 85	TFBGA048-0608
				LHF00L11						TFBGA048-0707
				LHF00L15						P-TSOP048-1220 (Normal bend)

Contact a SHARP sales office for other packages and top boot/bottom boot models other than those listed above.

■ System-Flash for Amusement Products

Supply voltage		32 M/64 M : $V_{CC} = 2.7$ to 3.6 V 256 M/512 M : $V_{CC} = 1.7$ to 1.95 V, $V_{CCQ} = 2.7$ to 3.6 V, $V_{PP} = 0.9$ to 1.95 V or 8.5 to 9.5 V								
Capacity (bit)	Bit configuration	Erasable block size		Model No.	Access time (ns) MAX.	Page mode access time (ns) MAX.	Read current (mA) MAX. f = 5 MHz (CMOS)	Standby current (μ A) MAX. (CMOS)	Operating temp. ($^{\circ}$ C)	Package
32 M	x 16	Parameter : 4 Kwords x 8 + 32 Kwords x 1 Main : 64 Kwords x 31	Top boot	LHF00L34	90	-	17	10	0 to 70	P-SOP044-0600
64 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 127	Top boot	LH28F640BFN-PTTLZ1A	90	35	25	25	0 to 70	P-SOP044-0600
256 M	x 16	Parameter : 16 Kwords x 4 Main : 64 Kwords x 255	Top boot	LH28F256BFN-PTSLZ2	100	25	22	60	0 to 85	P-SSOP070-0500
512 M	x 16	(Parameter : 16 Kwords x 4 Main : 64 Kwords x 255) x 2	Top/ Top boot	LH28F512BFBD-PTSLZ4	85	25	22	120	0 to 70	LFBGA072-0811
				LH28F512BFBD-PTSLZ2	90					
				LH28F512BFND-PTSLZ1	100				0 to 85	P-SSOP070-0500

Contact a SHARP sales office for other packages and top boot/bottom boot models other than those listed above.



■ System-Flash for Automotive Use

Supply voltage		V _{CC} = 2.7 to 3.6 V, V _{CCQ} = 2.7 to 3.6 V								
Capacity (bit)	Bit configuration	Erased block size		Model No.	Access time (ns) MAX.	Page mode access time (ns) MAX.	Read current (mA) MAX. f = 5 MHz (CMOS)	Standby current (μA) MAX. (CMOS)	Operating temp. (°C)	Package
32 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 63	Top boot	LH28F320BFHE-PTTLE0	70	25	25	20	-40 to 85	P-TSOP048-1220 (Normal bend)
64 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 127	Top boot	LH28F640BFHE-PTTLH1A	70	30	25	20	-40 to 85	P-TSOP048-1220 (Normal bend)
		Parameter : 4 Kwords x 8 Main : 32 Kwords x 127	Bottom boot	LH28F640BFHE-PBTLHK	70	30	25	20	-40 to 85	
128 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 255	Top boot	LH28F128BFHT-PTTLT1A	75	25	35	40	-40 to 85	P-TSOP056-1420 (Normal bend)
		Parameter : 4 Kwords x 8 Main : 32 Kwords x 127	Top/ Bottom boot	LH28F128BFHED-PWTLT2	70	30	25	40	-40 to 85	P-TSOP048-1220 (Normal bend)
256 M	x 16	Parameter : 4 Kwords x 8 Main : 32 Kwords x 255	Top/ Top boot	LH28F256BFHTD-PTTLZ3	75	25	40	80	-40 to 85	P-TSOP056-1420 (Normal bend)

■ System-Flash for Network Equipment

Supply voltage		V _{CC} = 2.7 to 3.6 V, V _{PP} = 2.7 to 3.6 V or 9.0 to 10.0 V								
Capacity (bit)	Bit configuration	Erased block size		Model No.	Access time (ns) MAX.	Page mode access time (ns) MAX.	Read current (mA) MAX. f = 5 MHz (CMOS)	Standby current (μA) MAX. (CMOS)	Operating temp. (°C)	Package
64 M	x 8/ x 16	64 Kwords x 64 or 128 Kbytes x 64	Symmetrical block	LH28F640SPHT-PL12B	120	25	35	120	-40 to 85	P-TSOP056-1420
128 M	x 8/ x 16	64 Kwords x 128 or 128 Kbytes x 128	Symmetrical block	LH28F128SPHT-PTL12B	120	25	35	120	-40 to 85	P-TSOP056-1420



■ Boot Block Type Flash Memory + Pseudo SRAM

● 1.8 V models with 1.8 V I/O voltage

Model No.	Flash memory block configuration	Capacity (bit) [Bit configuration]		Access time (ns) MAX.						Supply voltage (V)			Package
		Flash memory	Pseudo SRAM	Flash memory			Pseudo SRAM			Flash memory core voltage	Pseudo SRAM core voltage	I/O voltage	
				Random mode	Page mode	Synchronous burst mode	Random mode	Page mode	Synchronous burst mode				
LRS1890A	Bottom boot	256 M [x 16]	64 M [x 16]	85	25	-	70	20	-	1.7 to 1.95	1.7 to 1.95	1.7 to 1.95	LFBGA072-0811
LRS18A6			128 M [x 16]							1.7 to 1.9	2.7 to 3.1	1.7 to 1.9	LFBGA072-0811
LRS1897	Bottom/Top boot	512 M [x 16]	128 M [x 16]	85	25	-	70	20	-	1.7 to 1.9	2.7 to 3.1	1.7 to 1.9	LFBGA072-0811
LRS18CP	Bottom boot	128 M [x 16]	64 M [x 16]	85	25	-	70	20	-	1.7 to 1.95	1.7 to 1.95	1.7 to 1.95	LFBGA072-0811

● 1.8 V models with 3 V I/O voltage

Model No.	Flash memory block configuration	Capacity (bit) [Bit configuration]		Access time (ns) MAX.						Supply voltage (V)			Package	
		Flash memory	Pseudo SRAM	Flash memory			Pseudo SRAM			Flash memory core voltage	Pseudo SRAM core voltage	I/O voltage		
				Random mode	Page mode	Synchronous burst mode	Random mode	Page mode	Synchronous burst mode					
LRS18CJ	Top boot	64 M [x 16]	16 M [x 16]	85	25	-	85	-	-	1.7 to 1.95	2.7 to 3.1	2.7 to 3.1	LFBGA072-0811	
LRS18CKG	Bottom boot													
LRS18BK	Top boot	128 M [x 16]	32 M [x 16]	85	25	54 MHz	65	20	-	1.7 to 1.95	2.7 to 3.1	2.7 to 3.1	LFBGA088-0811	
LRS18BL	Bottom boot					64 M [x 16]							-	LFBGA072-0811
LRS18C8G													54 MHz	LFBGA088-0811
LRS18BN			54 MHz				LFBGA088-0811							
LRS18AZ*			256 M [x 16]				64 M [x 16]	54 MHz	LFBGA088-0811					
LRS18B0*						-		LFBGA072-0811						

* This flash memory is divided into two banks, each including an enable signal.

● 3 V models with 3 V I/O voltage

Model No.	Flash memory block configuration	Capacity (bit) [Bit configuration]		Access time (ns) MAX.						Supply voltage (V)			Package
		Flash memory	Pseudo SRAM	Flash memory			Pseudo SRAM			Flash memory core voltage	Pseudo SRAM core voltage	I/O voltage	
				Random mode	Page mode	Synchronous burst mode	Random mode	Page mode	Synchronous burst mode				
LRS18BT	Bottom boot	32 M [x 16]	8 M [x 16]	85	-	-	85	-	-	2.7 to 3.1	2.7 to 3.1	2.7 to 3.1	LFBGA072-0811
LRS1871A	Top boot	64 M [x 16]	16 M [x 16]	85	35	-	85	-	-	2.7 to 3.3	2.7 to 3.1	2.7 to 3.1	LFBGA072-0811
LRS1872A	Bottom boot												
LRS18831	Top boot		32 M [x 16]	70	35	-	60	-	-	2.7 to 3.1	2.7 to 3.1	2.7 to 3.1	LFBGA072-0811
LRS18841	Bottom boot												



Low Power-Loss Voltage Regulators

TO-220 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics			Built-in functions						Package Package shape type ^{*7}			
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation (W)		Output voltage V _o ^{*3} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i.o} ^{*5} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Lead forming available				
				Pd ^{*1}	Pd ^{*2}													
PQxxRD08J00H series	ASO protection function	0.8	20	1.25	10	5, 9, 12	±3	0.5	○	○	○	○	○	○	○	TO-220	A	
PQ3RD083J00H						3.3											A	
PQ6RD083J00H						6.3											A	
PQxxRA11J00H series	Low dissipation current at OFF state (I _{qs} : 1μA (MAX.))	1	35	1.5	15	5, 9, 12	±2.5	0.5	○	○	○	○	○	○	○	TO-220	B	
PQxxRD11J00H series			20			1.4											±3	○
PQxxxRDA1SZH series	ASO protection function, low dissipation current at OFF state (I _{qs} : 5μA (MAX.))	2	24	-	-	5, 8, 9, 12	±2.5	0.5	○	○	○	○	○	○	○	TO-220	A	
PQxxxRDA2SZH series			20			3.3											±3	○
PQ3RD13J000H	ASO protection function	1	10	1.4	15	3.3	±2.5	0.5	○	○	○	○	○	○	○	TO-220	A	
PQxxEF01SZH series	Minimum operating input voltage : 2.35 V (4 terminals)	2				1.5, 1.8, 2.5, 3.3											○	
PQxxEF02SZH series		2	○	A														
PQxxRF11J00H series	General purpose	1	35	1.5	18	5, 9, 12	±2.5	0.5	○	○	○	○	○	○	○	TO-220	B	
PQxxRH11J00H series		1.5	○			B												
PQ3RD23J000H	ASO protection function	2	20	1.4	15	3.3	±3	0.5	○	○	○	○	○	○	○	TO-220	A	
PQxxRD21J00H series			35			5, 9, 12											○	
PQxxRF21J00H series	General purpose	1.5	1.8	18	3.3	±2.5	0.5	○	○	○	○	○	○	○	○	TO-220	B	
PQ3RF23J000H	3.5	○															B	
PQ3RF33J000H	High output current	10	1.4	15	1.5 to 7	±2 ^{*4}	0.5	○	○	○	○	○	○	○	○	TO-220	A	
PQ070XF01SZH	Minimum operating input voltage : 2.35 V (4 terminals)	1															○	A
PQ070XF02SZH		2	○	A														
PQ070VK01FZH	Minimum operating input voltage : 2.35 V (5 terminals)	1	1.4	15	1.5 to 7	±2 ^{*4}	0.5	○	○	○	○	○	○	○	○	TO-220	E	
PQ070VK02FZH		2															○	E
PQ15RW08J00H	ASO protection function, minimum operating input voltage : 3.5 V	0.8	1.25	10	3.0 to 15	±2.5 ^{*4}	0.5	○	○	○	○	○	○	○	○	TO-220	A	
PQ15RW11J00H		1	1.4	15													○	A
PQ15RW21J00H		2	○	A														
PQ150RWA2SZH	ASO protection function	0.5	24	10	3.0 to 20	±2.5 ^{*4}	0.5	○	○	○	○	○	○	○	○	TO-220	C	
PQ20RX05J00H	Variable output voltage, output ON/OFF control	1															1.25	○
PQ20RX11J00H		17	12.5	1.5 to 15	○	E												
PQ150VB01FZH	Overheat shutdown circuit, minimum operating input voltage : 2.35 V (5 terminals)	2	○	○	○	○	○	○	○	○	○	○	○	○	○	TO-220	E	
PQ150VB02FZH		○	○	○	○	○												
PQ30RV11J00H	Variable output voltage	1	35	1.5	15	±2 ^{*4}	0.5	○	○	△ ^{*6}	○	○	○	○	○	TO-220	B	
PQ30RV21J00H		2		18	1.5 to 30												○	B
PQ30RV31J00H		3	2	20	○												B	
PQ7RV4J0000H		4.6	10	1.8	18												1.5 to 7	○

*1 At self-cooling
 *2 With infinite heat sink attached
 *3 The xx/xxx in the model No. refer to the output voltage values of the model (e.g. 05/050 for 5 V, 12/120 for 12 V, 015 for 1.5 V).
 *4 Reference voltage accuracy
 *5 Current ratings are defined individually.
 *6 △ : Available by adding circuit
 *7 Refer to page 72

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●High output current type [TO-220 high heat radiation type, TO-3P type]

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics			Built-in functions				Package
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation (W)		Output voltage V _o (V)	Output voltage precision (%)	Dropout voltage V _{i-o} *4 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Variable output voltage	
				Pd*1	Pd*2								
PQ5EV3J0000H	High output current, minimum operating input voltage : 2.35 V	3.5	7	1.6	45	1.5 to 5	±1*3	0.5	○	○	○	○	TO-220 (heat sink exposure)
PQ5EV5J0000H		5							○	○	○	○	
PQ5EV7J0000H		7.5							○	○	○	○	

*1 At self-cooling

*2 With infinite heat sink attached

*3 Reference voltage accuracy

*4 Current ratings are defined individually.

●Low output current type [TO-92 type]

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions		Package	
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation Pd*1 (W)	Output voltage V _o (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} (V)	Overheat protection	Overcurrent protection		
PQ033ES1MXPQ	Low output current type with general purpose TO-92 package (for auxiliary power supply)	0.15	16	0.52	3.3	±2	0.4 (I _o = 150 mA)	○	○	TO-92	
PQ050ES1MXPQ					5						
PQ033ES3MXPQ		0.3	9		3.3						0.7 (I _o = 300 mA)
PQ050ES3MXPQ					5						

*1 At self-cooling

Power Devices/
Analog ICs

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■ Surface Mount Type Low Power-Loss Voltage Regulators

● SOT-23-5 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics				Built-in functions				Package
		Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output current Io (A)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage Vi-o (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	
PQ1Uxx1M2ZPH series	Compact, low output current	16	0.35	0.18	1.8, 2.5, 2.8, 3.0, 3.3, 3.5, 5.0	±2.0 (3.0 V output)	0.26 (Io = 60 mA)	○	○	○	○	SOT-23-5
PQ1Xxx1M2ZPH series	Compact, ceramic capacitor compatible	9			*3			○	○	○	○	
PQ1XAx1M2ZPH series	Compact, ceramic capacitor compatible, high reliability	9			*4	±2.0		○	○	○	○	

*1 When mounted on a board

*2 The xx in the model No. refer to the output voltage values of the model (e.g. 50 for 5.0 V, 18 for 1.8 V).

*3 1.5, 1.8, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.3, 3.5, 3.7, 4.0, 4.5, 5.0

*4 1.5, 1.8, 2.5, 3.0, 3.3, 5.0

● SOT-23L type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics				Built-in functions				Package
		Output current Io (A)	Input voltage Vin (V)	Power dissipation Pd*1 (W)	Output current Io (A)	Output voltage Vo*2 (V) TYP.	Output voltage precision (%)	Dropout voltage Vi-o (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	
PQ1RxxJ0000H series	Compact, surface mount type, low dissipation current at OFF state (Iqs: 0.1 μA (MAX.))	–	16	0.4	0.18	*3	±2.7 (3.0 V output)	0.26 (Io = 60 mA)	○	○	○	○	SOT-23L
PQ1Kxx3M2ZPH series	Compact, surface mount type, high ripple rejection, output current of up to 300 mA	0.3	9		–	1.8, 2.5, 3.0, 3.3, 3.6, 5.0	±2.0 (3.0 V output)	0.7 (Io = 300 mA)	○	○	○	○	
PQ1KAxx3M2ZPH series	Compact, surface mount type, output current of up to 300 mA, ceramic capacitor compatible		15		–	1.5, 1.8, 2.5, 3.3, 5.0, 9.0			○	○	○	○	

*1 When mounted on a board

*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 47 for 4.7 V, 50 for 5.0 V).

*3 1.8, 2.0, 2.3, 2.5, 2.7, 2.8, 2.9, 3.0, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8, 4.0, 4.2, 4.4, 4.7, 4.9, 5.0, 5.2

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●SOT-89 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions					Package
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation P _d *1 (W)	Output voltage V _o *2 (V) TYP.	Output voltage precision (%)	Dropout voltage V _{I-O} *3 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	
PQ1Lxx3M2SPQ	Compact, high radiation package, low dissipation current at OFF state (I _{qs} : 1 μA (MAX.))	0.3	16	0.9	1.5, 1.8, 2.5, 3.0, 3.2, 3.3, 5.0	±2.0 (3.0 V output)	0.7	○	○	○	○	SOT-89	
PQ1Lxx3M3SPQ	Compact, high radiation package, low dissipation current at OFF state (I _{qs} : 1 μA (MAX.)), ceramic capacitor compatible		15		1.5, 1.8, 2.5, 3.3, 5.0, 9.0			○	○	○	○		
PQ1Lxx5MSP series	Compact, high radiation package, ceramic capacitor compatible	0.5	12		1.5, 1.8, 2.5, 3.3, 5.0	±2.0		0.4	○	○	○		○
PQ1Lxx95MSPQ	Ceramic capacitor compatible, variable output voltage				1.5 to 9.0	±2.0*6	○		○	○	○		
☆PQ1LBxx5MSPQ	Compact, high radiation package, ceramic capacitor compatible	0.35	9		1.5, 1.8, 2.5, 3.3, 5.0	±2.0	0.7	○	○	○	○		
PQ1Mxx5M2SPQ	Compact, high output current, ceramic capacitor compatible				1.8, 2.5, 3.3, 5.0	±2.0 (5.0 V output)		○	○	○	○		
PQ1MX55M2SPQ	Ceramic capacitor compatible, variable output voltage				1.3 to 5.0	±2.0*6		○	○	○	○		
PQ1Nxx3MxSPQ	Reset signal output function*4, ceramic capacitor compatible	0.8	6		2.5, 3.3	±2.0	0.3	○	○	○	○		
PQ1MGxx8MSPQ	Compact, ceramic capacitor compatible				0.8, 1.0, 1.2	±2.0		○	○	○	○		
PQ1MGX38MSPQ	Compact, ceramic capacitor compatible, variable output type				0.5 to 3.5	±2.0		○	○	○	○		
PQ2Lxx2MSPQ	Compact, high radiation package, 2 outputs	0.25/ch	9	*5	–	0.4	○	○	○	○			

*1 When mounted on a board

*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 50 for 5.0 V). [Except PQ2Lxx2MSPQ]

*3 Current ratings are defined individually.

*4 Reset detection voltage: 4.2 V, 3.8 V

*5 Output voltage combination: 3.3/3.3 V, 3.3/2.5 V, 3.3/1.8 V, 3.3/1.5 V, 2.5/1.8 V, 2.5/1.5 V

*6 Reference voltage accuracy

Power Devices/
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☆New product
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●SC-63 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics				Built-in functions							Package Package shape type ⁶	
		Output current I _o (A)			Input voltage V _{in} (V)	Power dissipation P _d ^{*1} (W)	Output voltage V _o ^{*2} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{1-o} ^{*5} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Taped package			
		0.5	1	1.5														
PQ07VR5MAPH series	Reset signal generation function (input voltage drop detection)	○			10	1.5 to 7	±2.0 ^{*3}		○	○			○	○	F			
PQ3DZ53J000H	ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.))	○			24	3.3			○	○	○	○		○	F			
PQ3DZ13J000H			○									○	○	○	○		○	F
PQxxDZ51J00H series		○					5, 9, 12	±3.0		○	○	○	○		○	F		
PQxxDZ11J00H series			○									○	○	○	○		○	F
PQxxxDNA1ZPH series		Ceramic capacitor compatible, ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), solder dip compatible lead shape				○		3.3, 5, 8, 9, 12			○	○	○	○		○	G	
PQxxxDZ01ZPH series	Low dissipation current at OFF state (I _{qs} : 5 μA (MAX.))			○	9, 10	3.3, 5			○	○	○	○		○	F			
PQxxxEZ5MZPH series	Minimum operating input voltage: 2.35 V	○				1.5, 1.8, 2.5, 3.0, 3.3	±2.5 ^{*4}		○	○	○	○		○	F			
PQxxxEZ01ZPH series				○							○	○	○	○		○	F	
PQxxxEN01ZPH series	Minimum operating input voltage: 2.35 V, solder dip compatible lead shape			○		1.5, 1.8, 2.5, 3.3	±2.5		○	○	○	○		○	G			
PQxxxENA1ZPH series				○	10				1.2, 1.5, 1.8, 2.5, 3.3	±2.0		○	○	○	○		○	G
☆PQxxxENB1ZPH series	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape			○		1.5, 1.8, 2.5, 3.3	-	-	○	○	○	○		○	G			
PQxxxENAHZPH series				○								○	○	○	○		○	G
PQxxxEZ1HZPH series	Minimum operating input voltage: 2.35 V			○		1.5, 1.8, 2.5, 3.0, 3.3	±2.5 ^{*4}	1.0	○	○	○	○		○	F			
PQxxxEZ02ZPH series				○	(2 A)						0.5	○	○	○	○		○	F
PQxxxFZ5MZPH series	Minimum operating input voltage: 1.7 V (Dual power supply type)	○			3.7	1.0, 1.2	±30 mV		○	○	○	○		○	F			
PQxxxGN01ZPH series	Minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape			○	5.5	0.8, 1.0, 1.2	-	-	○	○				○	G			
PQxxxGN1HZPH series				○									○	○				○
★PQxxxGM02ZPH	Minimum operating input voltage: 1.1 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape			○	-		±2.0	0.3	○	○				○	G			
PQ070XZ5MZPH series	Minimum operating input voltage: 2.35 V	○			10	1.5 to 7	±2.0 ^{*3}	0.5	○	○	○	○		○	F			
PQ070XZ01ZPH				○								○	○	○	○		○	F
PQ070XN01ZPH				○									○	○	○	○		○

*1 With infinite heat sink attached

*2 The xx/xxx in the model No. refer to the output voltage values of the model (e.g. 033 for 3.3 V, 05/050 for 5 V, 12/120 for 12 V).

*3 Reference voltage accuracy *4 The value is defined as ± 50 mV in some models. *5 Current ratings are defined individually. *6 Refer to page 72

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☆New product
★Under development



●SC-63 type (cont'd)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics			Built-in functions							Package Package shape type ⁶										
		Output current I _o (A)			Input voltage V _{in} (V)	Power dissipation P _d ^{*1} (W)	Output voltage V _o ^{*2} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{1-o} ^{*5} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Taped package											
		0.5	1	1.5																						
PQ070XNA1ZPH	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape		○		10	1.5 to 7	±2.0 ^{*3}	0.5	○	○	○	○	○	○	○	G										
PQ070XNAHZPH				○													-	○	○	○	○	○	○	○	○	G
☆PQ070XNB1ZPH			○																							
PQ070XZ1HZPH	Minimum operating input voltage: 2.35 V			○	1.5 to 7	±2.0 ^{*3}	1.0	○	○	○	○	○	○	○	○	F										
PQ070XZ02ZPH				○ (2 A)													0.5	○	○	○	○	○	○	○	○	○
PQ015YZ5MZPH	Reference voltage (V _{ref}): 1.0 V, minimum operating input voltage: 1.7 V (Dual power supply type)	○			3.7	1.0 to 1.5	±3.0 ^{*3}		○	○						F										
PQ035ZN01ZPH	Reference voltage (V _{ref}): 0.6 V, minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape		○		5.5												0.8 to 3.5	±30 mV	-	○	○					
PQ035ZN1HZPH				○		-	±2.0	0.3	○	○																
★PQ035ZM02ZPH	Minimum operating input voltage: 1.1 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape			○ (2 A)	8												1.5 to 20	±2.0 ^{*3}		○	○	○	○	○	○	○
PQ20VZ51J00H	Minimum operating input voltage: 4.5 V	○				24	3.0 to 20	±2.5 ^{*3}		○	○	○	○	○	○	○										
PQ20VZ11J00H				○	3.0 to 20												±2.5 ^{*3}	○	○	○	○	○	○	○	○	○
PQ20WZ51J00H	Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.))	○				24	3.0 to 20	±2.5 ^{*3}	0.5	○	○	○	○	○	○	○										
PQ20WZ11J00H				○	3.0 to 20												±2.5 ^{*3}	○	○	○	○	○	○	○	○	○
PQ200WNA1ZPH	Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), ceramic capacitor compatible, solder dip compatible lead shape			○		6.8	3.0 to 20	±2.5 ^{*3}	0.5	○	○	○	○	○	○	○										
PQ200WN3MZPH		Minimum operating input voltage: 3.5 V, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), ceramic capacitor compatible, current limit: 800 mA	○ (0.3)														6.8	3.0 to 20	±2.5 ^{*3}	0.5	○	○	○	○	○	○

*1 With infinite heat sink attached

*2 The xx/xxx in the model No. refer to the output voltage values of the model (e.g. 033 for 3.3 V, 05/050 for 5 V, 12/120 for 12 V).

*3 Reference voltage accuracy *4 The value is defined as ± 50 mV in some models. *5 Current ratings are defined individually. *6 Refer to page 72

Power Devices/
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★Under development



●TO-263 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions					Taped package	Package
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation P _d *1 (W)	Output voltage V _o *2 (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} *4 (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage		
PQxxxY053ZPH	High output current (minimum operating input voltage: 2.35 V)	5.0	7	35	1.5, 2.5, 3.3	1.0	0.5	○	○	○	○	○	○	TO-263
PQ05VY053ZPH					1.5 to 5	1.0*3		○	○	○	○	○		
PQxxxY3H3ZPH		3.5			1.5, 2.5, 3.3	1.0		○	○	○	○	○		
PQ05VY3H3ZPH					1.5 to 5	1.0*3		○	○	○	○	○		
PQxxxEH02ZPH	2 A output (minimum operating input voltage: 2.35 V)	2.0	10	35	1.5, 1.8, 2.5	±2.5	0.5	○	○	○	○	○	○	TO-263
★PQxxxEHS2ZPH	2 A output (minimum operating input voltage: 2.35 V), built-in soft start function				1.2, 1.5, 1.8, 2.5, 3.3	±2.5		○	○	○	○			
PQ070XH02ZPH	2 A output (minimum operating input voltage: 2.35 V)				1.5 to 7	±2.0*3		○	○	○	○	○		
★PQxxxEHA2ZPH	2 A output (minimum operating input voltage: 2.35 V)				1.5, 1.8, 2.5, 3.3	–		○	○	○	○	○		
★PQ070XHA2ZPH	2 A output (minimum operating input voltage: 2.35 V), ceramic capacitor compatible	1.0	10	35	1.5 to 7	–	0.5	○	○	○	○	○	○	TO-263
PQxxxEH01ZPH	1 A output (minimum operating input voltage: 2.35 V)				1.5, 1.8, 2.5	±2.5		○	○	○	○	○		
PQ070XH01ZPH	1 A output (minimum operating input voltage: 2.35 V)				1.5 to 7	±2.0*3		○	○	○	○	○		

*1 With infinite heat sink attached

*2 The xxx in the model No. refer to the output voltage values of the model (e.g. 015 for 1.5 V, 025 for 2.5 V, 033 for 3.3 V).

*3 Reference voltage accuracy

*4 Current ratings are defined individually.

●SOP-8 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics		Built-in functions			Taped package	Package
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation P _d * (W)	Output voltage V _o (V) TYP.	Output voltage precision (mV)	Overheat protection	Overcurrent protection			
PQ1DX095MZPQ	Built-in sink source function (For DDR II memory)	±0.8	6	0.6	V _{DD} x 1/2 (V _{DDQ} : 1.5 V (MIN.))	–	○	○	○	SOP-8	
PQ1DX125MZPQ	Built-in sink source function (For DDR memory)				V _{DD} x 1/2 (V _{DDQ} : 2.3 V (MIN.))	±35	○	○	○		

* When mounted on a board

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■ Surface Mount Type Chopper Regulators (DC-DC Converters)

(Ta = 25°C)

Model No.	Features	No. of output circuits	Output type			Built-in SW Tr	Input voltage range Vin (V)	Switch current Isw (A)	Output voltage Vo (V)	Oscillation frequency fo (Hz) TYP.	Package
			Step down	Step up	Inversion						
PQ6CU11X1APQ	<ul style="list-style-type: none"> High voltage CMOS output: 30 V (MAX.) White LED driver for backlight Output ON/OFF control function Overvoltage/overcurrent protection circuits Soft start function 	1		○			up to 5.5	-	1.2 M	SOT-23-6	
PQ6CB11X1AP	<ul style="list-style-type: none"> High voltage CMOS output: 30 V (MAX.) White LED driver for backlight (Capable of driving up to 4 LEDs in series connection) Output ON/OFF control function Overvoltage/overcurrent protection circuits Soft start function 			○			2.7 to 5.5			up to 30	USB-6
PQ6CB11X1CP	<ul style="list-style-type: none"> High voltage CMOS output: 30 V (MAX.) White LED driver for backlight (Capable of driving up to 6 LEDs in series connection) Output ON/OFF control function Overvoltage/overcurrent protection circuits Soft start function 			○			2.7 to 5.5	up to 36	300 k to 800 k*7		
PQ6CU12X2APQ	<ul style="list-style-type: none"> High switching voltage: 40 V (MAX.) For tuner power supply Output ON/OFF control function 			○			3.0 to 5.5			up to 30	2 M
PQ7L2010BP	<ul style="list-style-type: none"> Possible to correspond also to operation in the minute lighting mode High frequency PWM control for brightness adjustment Output ON/OFF control function 			○			2.7 to 5.5	from 0.8	Switchable between 2.0 M and 1.2 M		
★PQ5CB11X1AP	<ul style="list-style-type: none"> PWM chopper regulator Sleep mode function (by switching between PWM and PFM) Overvoltage/overcurrent protection circuits Soft start function 		○				2.7 to 5.5			VREF*2 to 35*5 (step-down type)/ -VREF*2 to -30*5 (inverting type)	300 k
PQ1CZ38M2ZPH series	<ul style="list-style-type: none"> PWM chopper regulator (high oscillation frequency) Output ON/OFF control function Overcurrent/overheat protection circuits For light load 		○	○	○		up to 40	100 k	300 k		
PQ1CZ21H2ZPH	<ul style="list-style-type: none"> PWM chopper regulator Output ON/OFF control function Overcurrent/overheat protection circuits Low dissipation current at OFF state (Standby current <I_{SD}>: 1 μA (MAX.)) 		○		○		up to 40			150 k	400 k
PQ1CZ41H2ZPH	<ul style="list-style-type: none"> PWM chopper regulator (high oscillation frequency) Output ON/OFF control function Overcurrent/overheat protection circuits 		○		○		up to 40	150 k	400 k		
PQ1CX12H2ZPQ	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 90% (TYP.)) Low dissipation current 		○				up to 33			VREF*3 to 24*5 (step-down type)	150 k
PQ1CX22H2ZPQ	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 90% (TYP.)) Low dissipation current Low voltage output: 1.2 V (MIN.) 		○				up to 33	VREF*4 to 24*5 (step-down type)	400 k		
☆PQ1CX41H2ZPQ	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 90% (TYP.)) Low voltage output: 0.8 V (MIN.) Ceramic capacitor compatible 		○				up to 28			VREF*2 to 35*5 (step-down type)/ -VREF*2 to -30*5 (inverting type)	150 k
PQ1CY1032ZPH	<ul style="list-style-type: none"> PWM chopper regulator Output ON/OFF control function Overheat protection/overcurrent shutdown circuits High output current type 		○		○		up to 40	3.3, 5.0*6 (TYP.)			
PQ1CYxx3HZPH series PQ1CYxx3LZPH series	<ul style="list-style-type: none"> PWM chopper regulator Output ON/OFF control function Overheat protection circuit Fixed output voltage: 3.3 V or 5 V 		○				up to 40		3.3, 5.0*6 (TYP.)		

*1 Peak current (absolute maximum ratings) *2 VREF nearly equal to 1.26 V (TYP.) *3 VREF nearly equal to 1 V (TYP.) *4 VREF nearly equal to 0.8 V (TYP.)
 *5 Output voltage variable range
 *6 The xx in the model No. refer to the output voltage values of the model (e.g. 33 for 3.3 V, 50 for 5.0 V).
 *7 Selectable oscillation frequency range

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★Under development



■ Surface Mount Type Chopper Regulators (DC-DC Converters) (cont'd)

(Ta = 25°C)

Model No.	Features	No. of output circuits	Output type			Built-in SW Tr	Input voltage range Vin (V)	Switch current Isw (A)	Output voltage Vo (V)	Oscillation frequency fo (Hz) TYP.	Package
			Step down	Step up	Inver-sion						
IR3M18N	<ul style="list-style-type: none"> Soft start function Undervoltage protection circuit Timer latch short-circuit protection circuit Standby function 	1		○		2.2 to 6.0	(Determined by external Tr)	(Determined by external Tr)	100 k to 1 M ^{*3}	P-SSOP008-0150	
IR3M19N	<ul style="list-style-type: none"> High transient load characteristics from built-in current control circuit Soft start function Overcurrent/overvoltage/undervoltage protection circuits Internal reference voltage accuracy (±1%) 		○			4.5 to 22		1.24 to input voltage	220 k		
★IR3M56N	<ul style="list-style-type: none"> High efficiency synchronous rectified step-down converter Current mode control Soft start function Overcurrent/overvoltage/undervoltage/overheat protection circuits 		○			External	4.5 to 36	(Determined by external Tr)	0.8 to 6.3		200 k/300 k/400 k/500 k/external sync.
★IR3M57N	<ul style="list-style-type: none"> High efficiency two channel synchronous rectified step-down converter Current mode control Soft start function Overcurrent/overvoltage/undervoltage/overheat protection circuits 	2	○			4.5 to 36	(Determined by external Tr)	0.8 to 6.3	200 k/300 k/400 k/500 k/external sync.	P-TSSOP028-0225	
IR3M30U	<ul style="list-style-type: none"> ON/OFF sequence setting Timer latch short-circuit protection circuit Soft start function Overcurrent/undervoltage/overheat protection circuits 	3	○	○		△ ^{*1}	2.7 to 5.5	1 ^{*2} (when using internal Tr)	External setting	70 k to 1M ^{*3}	P-VQFN036-0505
			○	○	○	External		External setting			
IR3M58M/U	<ul style="list-style-type: none"> ON/OFF sequence setting without external control Timer latch phase fault protection circuit Soft start function Overcurrent/undervoltage/overheat protection circuits 		○	○		△ ^{*1}	4.5 to 28	0.4 ^{*2} (when using internal Tr)			
		○			External	External setting					

*1 Built-in SW Tr can be used in step-up mode; external SW Tr is required in step-down or inverting mode.

*2 Constant current (MAX.)

*3 Selectable oscillation frequency range

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■ Chopper Regulators (DC-DC Converters)

● TO-220 type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Package	
		Switch current I _{sw} (A)	Input voltage V _{in} (V)	Power dissipation P _d *1 (W)	Output voltage V _o *2 (V)	Oscillation frequency f _o (kHz) TYP.	Output saturation voltage V _{sat} (V) TYP.	Outline shape type*5	
PQ1CG38M2FZH	<ul style="list-style-type: none"> • PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • For light load • Output ON/OFF control function 	0.8*3	40	14	V _{REF} *4 to 35 (step-down type)/ -V _{REF} *4 to -30 (inverting type)	300	0.9	TO-220	E
PQ1CG38M2RZH									D
PQ1CG21H2FZH	<ul style="list-style-type: none"> • PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 	1.5*3				100	1.0		E
PQ1CG21H2RZH									D
PQ1CG41H2FZH	<ul style="list-style-type: none"> • PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 	300				0.9	E		
PQ1CG41H2RZH							D		
PQ1CG2032FZH	<ul style="list-style-type: none"> • PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 	3.5*3				70	1.4		E
PQ1CG2032RZH									D
PQ1CG3032FZH	<ul style="list-style-type: none"> • PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 					150			E
PQ1CG3032RZH									D
PQ2CF1J0000H	<ul style="list-style-type: none"> • PWM chopper regulator • Built-in overcurrent/overheat protection circuits 	2.5*3	35	15	4.5 to 35 (step-up type)	50	0.6	E	

*1 With infinite heat sink attached *2 Output voltage variable range *3 Peak current *4 V_{REF} nearly equal to 1.26 V (TYP.) *5 Refer to page 72

Power Devices/
Analog ICs

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Power Supply ICs for CCDs/CCD Camera Modules

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	SW Tr	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M52Y7	5	2.7 to 5.5	15	Step-up type PWM + REG	1 M	Built-in	20 (DC)	–	41WL-CSP*2
			–8	Inverting type PWM		External	–	1 000	
			2.5 to 3.3	REG	–	–	100 (DC)	–	
			2.5 to 3.3	REG			100 (DC)	–	
			1.8/1.2	REG			100 (DC)	–	
IR3M61U*1/63U	4	4.5 to 10	15	Charge pump	200 k	–	12 (DC)	–	P-VQFN032-0505
			–8	Negative charge pump			2.5 (DC)	–	
			3.3	Step-down type PWM + REG	1 M	Built-in	120 (DC)	–	
			1.8	Step-down type PWM + REG			50 (DC)	–	
IR3M55U*1/59U	3	4.5 to 16	15/12	Charge pump	200 k	–	12/20 (DC)	–	P-VQFN032-0505
			–8/–5	Negative charge pump			2.5/5 (DC)	–	
			3.3	Step-down type PWM + REG	1 M	Built-in	150 (DC)	–	

*1 For automotive use

*2 3.97 mm x 3.97 mm x 0.82 mm (TYP.)

Power Supply ICs for TFT-LCDs

Model No.	No. of output circuits	Input voltage range (V)	Output voltage (V)	System	Switching frequency (Hz)	SW Tr	Switching current (mA) [Built-in SW Tr]	Drive capacity (pF) [External SW Tr]	Package
IR3M58M/U		4.5 to 28	External setting	Step-up (20 V (MAX.)) / step-down type PWM	70 k to 500 k	Built-in (Step-up type)	400	1 000	P-QFP048-0707/ P-VQFN036-0505
				Step-down type PWM		External	–		
				Step-down, inverting type PWM		External	–		
IR3M30U	3	2.7 to 5.5	External setting	Step-up, step-down, step-up/down type PWM	70 k to 1 M	Built-in (Step-up type)	1 000	–	P-VQFN036-0505
				Step-up, step-down, step-up/down, inverting type PWM		Built-in (Step-up type)	1 000	–	
				Step-up, step-down, step-up/down, inverting type PWM		External	–	1 000	
IR3M16U		2.6 to 3.6	15.3	Charge pump	100 k	–	0.1 (DC)	–	P-HQFN020-0404
			5.1	Charge pump + REG		–	5 (DC)	–	
			–10.2	Negative charge pump		–	0.1 (DC)	–	

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■ Fail Safe ICs

Model No.	Features	Operating voltage			Dissipation current (μ A) TYP.	Operating temp. ($^{\circ}$ C)	Package
		VBAT (V)	VBAC (V)	VIO (V)			
IR3T46U6	<ul style="list-style-type: none"> • Malfunction detection • Built-in 8-bit ADC • Built-in timer circuit • Built-in key detection output OR gate 	3.2 to 4.5	3.0 to 3.3	2.6 to 3.0	10	-20 to +85	P-HQFN024-0404
IR3T48Y6	<ul style="list-style-type: none"> • Small package • Built-in 3-STATE buffer • Malfunction detection • Built-in 8-bit ADC • Built-in timer circuit • Built-in key detection output OR gate 			1.6 to 3.0			35WL-CSP*

* 3.0 mm x 3.0 mm x 0.975 mm (TYP.)

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■ LED Drivers

● Built-in step up circuit (1)

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Built-in constant current circuit	Built-in SW Tr	Input voltage range (V)	Output current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
PQ6CU11X1APQ	White LED driver for backlight (for small panels)	<ul style="list-style-type: none"> High voltage CMOS output: 30 V (MAX.) Output ON/OFF control function Overvoltage/overcurrent protection circuits Softstart function 	1	3 (Series connection)	PWM	*1	○	to 5.5	250*2	1.2 M	SOT-23-6
PQ6CB11X1AP				4 (Series connection)		*1	○	2.7 to 5.5			
PQ6CB11X1CP				6 (Series connection)		*1	○				2.0 M
PQ7L2010BP				4 (Series connection)		*1	○				
IR2E46Yx	RGB LED driver for picture lights and illuminations	<ul style="list-style-type: none"> I²C bus control Illumination mode (64 levels/ch) Picture light mode (32 levels/ch) Brightness adjustment Standby function/soft start function Overcurrent/undervoltage/overheat protection circuits 	3	3		○	○	2.7 to 4.5	155/ch*3 (in picture light mode)	1.2 M	33WL-CSP*6
IR2E47Ux	White LED driver for backlight (for small panels)	<ul style="list-style-type: none"> Independent current control for two systems (4 outputs and 2 outputs) LED non-connected judging function Brightness adjustment Undervoltage/overheat protection circuits 	6	4 + 2	Charge pump	○	—	2.7 to 5.5	20/ch*3	1 M	P-VQFN024-0404
IR2E49U	White LED driver for backlight (for medium panels)	<ul style="list-style-type: none"> Built-in 150 mA driver for each channel Step-up DC-DC output short-circuit protection function Current driver output open detection Capable of external brightness adjustment using PWM input signal Overcurrent/overvoltage/undervoltage/overheat protection circuits 	5	40	PWM	○	External	6 to 28	150/ch*3,4	100 k to 1 M*5	P-VQFN036-0606
IR2E51Y6	LED driver for backlight and call alert display (auto brightness adjustment)	<ul style="list-style-type: none"> Capable of direct connection of ambient light sensor Brightness adjustment by ambient illuminance feedback (16-step ambient illuminance/128-level illuminance) (for main LCDs) Non-external coil thanks to charge pump drive Capable of driving 4 main-LEDs, 2 sub-LEDs, and 3 call alert LEDs with a single device. I²C interface-compatible Standby function/power on reset function/soft start function 	9	4 + 2 + 3	Charge pump	○	—	3.0 to 4.5 (for drive)/2.3 to 3.2 (for control)	25/ch*3	660 k	35WL-CSP*6
☆IR2E53Yx	Multi-channel output LED driver	<ul style="list-style-type: none"> Capable of controlling up to 6 RGB LEDs or 18 LEDs Diversified illumination without imposing a burden on the CPU External coils unnecessary due to use of the charge pump method I²C interface-compatible Standby function/power on reset function/soft start function 	18 (Matrix)	18	Charge pump	○	—	3 to 4.5	25.9/ch*3	660 k	WL-CSP*6

*1 LED constant current value can be set by external resistors.
 *2 Peak switch current
 *3 Constant current (MAX.)
 *4 Use this IC within the range of power dissipation.
 *5 Selectable oscillation frequency range
 *6 3.57 mm x 3.57 mm x 0.82 mm (TYP.)

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☆New product
★Under development



LED Drivers

Built-in step up circuit (2)

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Built-in constant current circuit	Built-in SW Tr	Input voltage range (V)	Output current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
☆IR2E54Ux	Control IC for brightness adjustment (Composite brightness adjustment system combining an LED driver and ambient light sensor)	<ul style="list-style-type: none"> External control terminal for adjusting the brightness of each frame (Brightness adjustment depending on display content) Built-in GPIO interface I²C interface-compatible Standby function/power on reset function 	1	—	—	○	—	2.3 to 3.2	27.4*1	—	P-VQFN024-0404
★IR2E55Yx	LED driver for backlight and call alert display (auto brightness adjustment)	<ul style="list-style-type: none"> Capable of driving 7 main-LEDs (series) and 6 call alert LEDs Auto brightness adjustment and PWM brightness adjustment Power supply for EL panel and LCD controller LDO 2ch Built-in GPIO interface I²C/SPI interface-compatible 	7	13	PWM + charge pump	○	○	3 to 4.2	Main 25.6/ch*1 Call alert 12.8/ch*1	1 M	48WL-CSP*2
★IR2E56U6	LED driver for backlight	<ul style="list-style-type: none"> Built-in 25 mA driver for each channel Capable of driving a maximum of 12 white LEDs (per channel) with high withstand voltage (45 V) output Capable of external brightness adjustment using PWM input signal Capable of controlling lights one by one or simultaneously 	6	72	PWM	○	External	5 to 28	25/ch*1	2 M	P-VQFN032-0505

*1 Constant current (MAX.)

*2 3.57 mm x 3.57 mm x 0.97 mm (TYP.)

External power supply for LEDs

Model No.	Function	Features	Supply voltage (V)	Package
IR2D20U	24-dot LED panel driver with constant-current sink outputs	<ul style="list-style-type: none"> Output current (constant current sink output) : 30 mA (MAX.) (setup by external resistor) Gradation function (clock cycle setting or external synchronization) Independent current control for three systems (for RGB LED) LED drive voltage : 15 V Rated output voltage : 20 V (MAX.) f_{CLK} : 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection) 	4.5 to 5.5	P-HQFN052-0707
IR2D071	16-dot LED panel driver with constant current sink outputs	<ul style="list-style-type: none"> Output current (constant-current sink output) : 60 mA (MAX.) (setup by external resistor) Rated output voltage : 7 V (MAX.) f_{CLK} : 20 MHz (MAX.)/16.6 MHz (MAX.) (at cascade connection) 	3.0 to 5.5	P-SDIP028-0400

Laser Diode Driver

Model No.	Application	Function	Drive mode	Maximum output current (mA) MIN.	Applicable SHARP diode type	Supply voltage (V)	Package
IR3C22N	For CD/DVD players	Built-in APC function, with inhibit input pin	—	150	P (Single power supply)	4.5 to 5.5	P-SSOP008-0150

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■ Video Interface ICs for TFT-LCDs

Model No.	Input signal					Color decode	LCD panel				Serial data control	Supply voltage (V) TYP.	Power consumption (mW) TYP.	Package
	Com-posite video	Y/color difference	Analog RGB	Digital RGB	OSD (Digital)		±power source	+power source	Low voltage source	Digital input				
IR3Y18A1	○				○	NTSC/PAL	○	○				4.5/12 or 4.5/-7.5	130	P-QFP048-0707
IR3Y26A2/A6			○*3			-			○			5/7.5	140	P-QFP048-1010/ P-QFP048-0707
IR3Y29A1/B1	○		○			NTSC/PAL			○				190	P-QFP048-0707
IR3Y31M1	○		○			NTSC/PAL	○	○			4.5/12 or 4.5/-7.5	160		
IR3Y37A1		○ (Common terminal)			○	-			○		3/6.5	106/88*6		
RB5P0010M2			○*3		○	-	○	○		○	3/12 or 3/4.5/-7.5	92		
RB5P0020M2		○ (Common terminal)			○	-			○		3/5	70/57*6		
RB5P0050M2		○ (Common terminal)			○	-			○	○		95/80*6		
RB5P0060M2	○		○			NTSC/PAL			○	○	3/5/13	120	P-QFP048-1010	
RB5P006AM2	○		○			NTSC/PAL			○	○				
RB5P0070M*1	○		○		○	NTSC/PAL				○	3/7	330	P-QFP072-1010	
RB5P0090M	○		○*3			NTSC/PAL (automatic identification)			○	○	5/13	250	P-QFP048-1010	
IR3Y63M*2	○	○	○	○	○ (Built-in)	NTSC/PAL/ SECAM			○	○*4	1.8/3/5	270	P-TQFP100-1414	
IR3Y66M*2				○		NTSC/PAL			○	○*4		130	P-QFP072-1010	
★IR3Y67M*1,2	○	○	○	○	○*7	NTSC/PAL/ SECAM				○	1.8/3	250	P-TQFP100-1414	

*1 For digital signal input panels

*2 Built-in timing generator

*3 Two inputs

*4 Both 3-wire and I²C are available.

*5 Only for I²C

*6 At analog input for RGB

*7 Both built-in OSD and external OSD are available.

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★Under development



■ Power Amplifiers for Wireless LAN

Model No.	Application	Operating frequency (GHz)	Supply voltage (V) TYP.	Output power (dBm) TYP.	Supply current (mA) TYP.	Gain (dB) TYP.	Detection function	Matching circuit	Package
IRM046U7▲	For 2.4 GHz wireless LAN (IEEE 802.11b/g)	2.4 to 2.5	3.3	18 (at EVM 3%)	105	30	○	–	P-HQFN024-0404
	For 5 GHz wireless LAN (IEEE 802.11a)	4.9 to 5.9		18 (at EVM 2%)	140	25	○	–	
★IRM065U7	For 2.4 GHz wireless LAN (IEEE 802.11b/g)	2.4 to 2.5		18 (at EVM 3%)	130	29	○	Built-in (IN/OUT)	P-HQFN016-0303
	For 5 GHz wireless LAN (IEEE 802.11a)	4.9 to 5.9		18 (at EVM 3%)	160	30	○	Built-in (IN/OUT)	
IRM047U7▲	For 2.4 GHz wireless LAN* (IEEE 802.11b/g)	2.4 to 2.5		18 (at EVM 3%)	105	30	○	–	P-HQFN024-0404
★IRM060U7	For 2.4 GHz wireless LAN (IEEE 802.11b/g)			16 (at EVM 2%)	80	28	○	Built-in (IN/OUT)	P-HQFN010-0202A
IRM063U7				18 (at EVM 3%)	120	30	○	Built-in (IN/OUT)	
IRM048U7▲	For 5 GHz wireless LAN (IEEE 802.11a)			18 (at EVM 2%)	140	25	○	–	P-HQFN024-0404
★IRM053U7				4.9 to 5.9	18 (at EVM 3%)	150	31	○	Built-in (IN/OUT)

* Can be used as a power amp for PHS and DECT (1.9 GHz band), or as a driver amp for FWA (1.9 to 2.6 GHz band).
The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

■ ICs for Audio Equipment

Model No.	Description	Function	Supply voltage (V)	Package
IR3R55M1	RF amp IC for Mini Disc players	Built-in RF amp, ADIP detection circuit, connectable to hologram pickup	2.4 to 3.3	P-TQFP048-0707
IR3R58M1		Built-in 2x speed RF amp, ADIP detection circuit, connectable to hologram pickup		
IR3R59N1	Audio amp IC	Built-in serial control input ATT and filter amp	±1.2 to ±3.25	P-SSOP024-0275

Notice

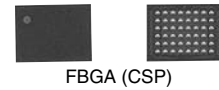
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■ CSP

● CSP (Chip Size Package)

The FBGA (commonly known as CSP) has an area array terminal structure with solder balls on the bottom, to give it a near chip-size footprint. This high-density, compact and low-profile package technology will greatly help in the design of compact mobile equipment, such as mobile phones and digital cameras.



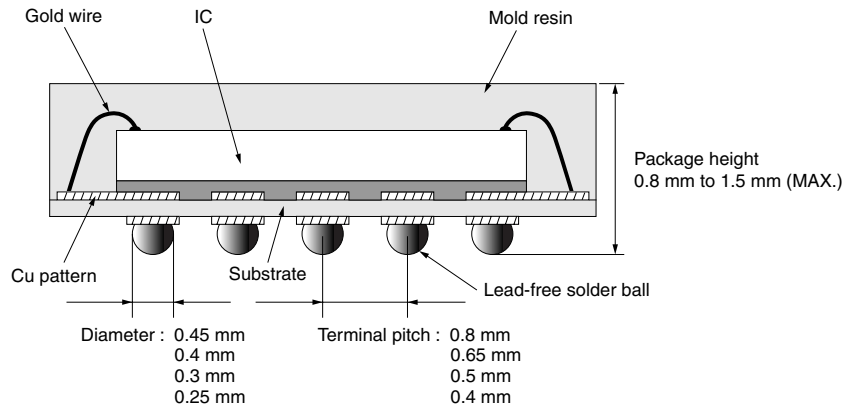
FBGA (CSP)

Features

- **Compact and lightweight**
Ability to create a near-chip size and lighter-weight package in comparison with conventional plastic packages.
- **High reliability**
Comparable high reliability with that of conventional plastic packages.
- **Mountability**
Conventional mounting system is available for CSP. SOP and QFP can be mounted together with CSP.

Terminal pitch	0.8 mm	0.65 mm	0.5 mm	0.4 mm
Maximum terminal counts	352 (16 mm x 16 mm)	352 (16 mm x 16 mm)	372 (16 mm x 16 mm)	264 (10 mm x 10 mm)
Nominal dimensions	6 mm x 6 mm to 16 mm x 16 mm			5 mm x 5 mm to 10 mm x 10 mm

Cross section example



● Wafer-level CSP

The wafer-level CSP (WL-CSP) is a kind of chip-size package which is manufactured by assembling directly onto the finished wafer.

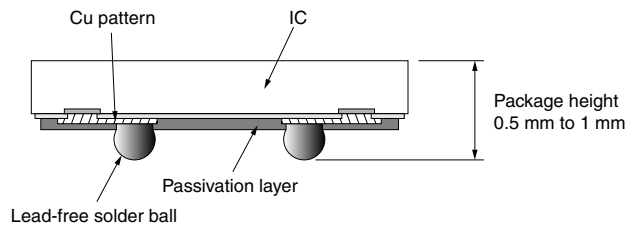
Features

- **Compact and thinner size**
It makes it possible to create an almost IC-size and lighter-weight package.
- **Mountability**
The conventional CSP mounting system can be also used in that of wafer-level CSP, which facilitates chip mounting more than bare-chip mounting does. It can be mounted together with other existing packages and passive components. (The use of underfill is recommended to improve the reliability of assembly.)

Chip size*	4 mm x 4 mm		3.5 mm x 3.5 mm		3 mm x 3 mm		2.5 mm x 2.5 mm	
Pad pitch	0.5 mm	0.4 mm	0.5 mm	0.4 mm	0.5 mm	0.4 mm	0.5 mm	0.4 mm
Maximum terminal counts	49 (7 x 7)	81 (9 x 9)	36 (6 x 6)	49 (7 x 7)	25 (5 x 5)	36 (6 x 6)	16 (4 x 4)	25 (5 x 5)

* Rectangular chip form is also available.

Cross section example

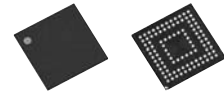




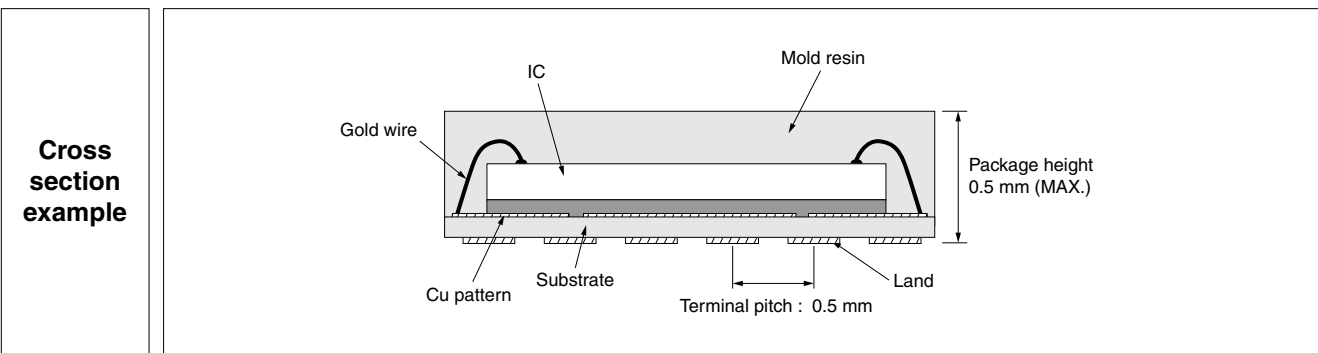
■ LGA

● LGA (Land Grid Array Package)

The LGA package has basically the same structure as the CSP, enabling a thin package by removing the solder balls from the bottom of the package. The LGA package contributes to the compact and thinner design of applications, such as mobile phones and digital cameras.



Features	<ul style="list-style-type: none"> ● Lower package height Achieves 0.5 mm Max. in package height. ● High reliability Comparable high reliability with that of conventional plastic package. ● Excellent mountability Conventional mounting system is available for LGA. SOP and QFP can be mounted together with LGA. 					
	<table border="1"> <tr> <td>Terminal pitch</td> <td>0.5 mm</td> </tr> <tr> <td>Maximum terminal count</td> <td>216 (10 mm x 10 mm)</td> </tr> <tr> <td>Nominal dimensions</td> <td>6 mm x 6 mm to 10 mm x 10 mm</td> </tr> </table>	Terminal pitch	0.5 mm	Maximum terminal count	216 (10 mm x 10 mm)	Nominal dimensions
Terminal pitch	0.5 mm					
Maximum terminal count	216 (10 mm x 10 mm)					
Nominal dimensions	6 mm x 6 mm to 10 mm x 10 mm					



Packages



■ SiP (System in Package)

System in Package is an original SHARP high-density mounting technology that achieves high-density memory capacity and multiple functions by stacking multiple ICs or multiple packages. This technology has two major streams. One method refers to a chip-stacked package technology that can achieve up to 5-chip mounting by stacking ICs in a single package. The other method refers to a package stack technology with which it is possible to stack a package of over 5 chips, by stacking multiple packages in which 1 to 2 chips are stacked. The System in Package technology contributes to higher functionality of applications, such as mobile phones and digital cameras, as well as to reduction in size and weight.

● Chip Stacked CSP

<p>Features</p>	<ul style="list-style-type: none"> ● Wide variety of lineup It is possible to provide a wide lineup of stacked CSPs, including 2-chip, 3-chip, 4-chip and 5-chip stacked CSPs, to respond to customer needs. ● Compact and thinner size Encapsulating multiple ICs into an existing plastic package contributes to decreasing the mounting area. In addition, SHARP's wafer thinning technology makes it possible to achieve 1.4 mm (MAX.) package height. ● Multiple functions Multiple ICs of different sizes and functions, such as logic LSIs and memories, can be incorporated in a single package, making possible multiple functions. ● Same-size IC stacking technology SHARP's stacking technology enables stacking of multiple same-size ICs, contributing to higher memory density. <p>(4-chip stacked CSP) When using a SHARP four-chip stacked CSP, the mounting area and weight of a package can be decreased by half in comparison with using two 2-chip stacked CSPs, or a 3-chip stacked CSP and a conventional CSP.</p>
<p>Cross section example</p>	<p>(5-chip stacked CSP)</p> <p>Labels in diagram: Gold wire, IC, Mold resin, Package height 1.4 mm (MAX.)*, 1.6 mm (MAX.)*, Cu pattern, Substrate, Lead-free solder ball, Diameter : 0.45 mm, 0.30 mm, Terminal pitch : 0.8 mm, 0.5 mm</p> <p>* At 0.8 mm terminal pitch</p>



● Chip Stacked TSOP/QFP*/VQFN/HQFN

<p>Features</p>	<ul style="list-style-type: none"> ● Decreased mounting area By encapsulating two identical or different types of ICs into a single conventional plastic package, the mounting area of the package can be decreased. ● Multiple functions Thanks to the incorporation of different sizes and functions of multiple ICs, such as logic LSIs and memories, the functionality increases. ● Higher memory density When incorporating two identical memory ICs into a single package, memory density doubles on the same mounting area.
<p>Cross section example</p>	<p>(TSOP, QFP*) (Hamburger type)</p> <p>(Turtle stack type)</p> <p>(VQFN)</p> <p>(HQFN)</p> <p>Package height 1.0 mm (MAX.)</p>

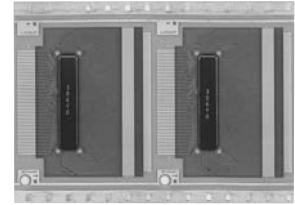
* Including TQFP and LQFP.



■ SOF

● SOF (System On Film)

SOF is a highly flexible thin film package, created from SHARP's TCP technologies. It can be easily bent, and contributes to thin and compact design of products. Peripheral circuit components can also be mounted.



Features	<ul style="list-style-type: none"> ● Highly flexible and thin film package By using highly flexible and thin film, SOF contributes to creating thin and compact products. It can also achieve finer terminal pitches and multiple outputs easily, and pattern layout on a film under the chip makes it possible to improve the flexibility of the pattern layout. ● Multiple chip mounting Plural bare chip mounting and incorporation of peripheral components contribute to the higher functionality of products.
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Cross section example	
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Film specifications	Film width : W_1	35 mm super wide	48 mm super wide	70 mm wide
	Maximum pattern layout area : W_2	28.6 mm	41.6 mm	59.0 mm
	Maximum device pitch : L	15 sprockets		
	Copper foil thickness	8 μ m		
	Copper foil type	Rolled or electrolytic		
	Copper foil plating	Tin (Sn)		
	Minimum pattern pitch	0.025 mm		
	Sprocket hole : A	1.981 mm (wide) / 1.42 mm (super wide)		
	Sprocket hole : B	1.981 mm (wide) / 1.42 mm (super wide)		


Other components	Bare chips and peripheral circuit components can be mounted on the film.
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In addition to the SOF described above, a conventional TCP (Tape Carrier Package) is also available.



Package Lineup

Surface-mount Type


Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package width & length x (seated height [MAX.]) mm		
FBGA (CSP)		LFBGA048-0606		0.8	6 x 6	6.0 x 6.0 x (1.4)		
		TFBGA048-0608	48		6 x 8	6.0 x 8.0 x (1.2)		
		TFBGA048-0808			8 x 8	8.0 x 8.0 x (1.2)		
		TFBGA056-0808	56					
		TFBGA060-0811	60 (48)*					
		TFBGA064-0811	64			8 x 11	8.0 x 11.0 x (1.2)	
		TFBGA072-0811						
		LFBGA072-0811	72 (64)*				8.0 x 11.0 x (1.4) / (1.6)	
		TFBGA081-0808	81			8 x 8	8.0 x 8.0 x (1.2)	
		LFBGA085-0811	85					
		LFBGA087-0811	87			8 x 11	8.0 x 11.0 x (1.4) / (1.6)	
		LFBGA088-0811						
		LFBGA088-0912	88			9 x 12	9.0 x 12.0 x (1.4) / (1.6)	
		LFBGA090-0811	90			8 x 11	8.0 x 11.0 x (1.4) / (1.6)	
		TFBGA096-1010	96			10 x 10	10.0 x 10.0 x (1.2)	
		LFBGA107-0912	107			9 x 12	9.0 x 12.0 x (1.4) / (1.6)	
		TFBGA111-1010	111					
		TFBGA112-1010	112			10 x 10	10.0 x 10.0 x (1.2)	
		LFBGA115-0914	115			9 x 14	9.0 x 14.0 x (1.4) / (1.6)	
		LFBGA116-1010	116			10 x 10	10.0 x 10.0 x (1.4) / (1.6)	
		LFBGA130-1013	130			10 x 13	10.0 x 13.0 x (1.4) / (1.6)	
		TFBGA144-1111	144			11 x 11	11.0 x 11.0 x (1.2)	
		TFBGA160-1212	160				12.0 x 12.0 x (1.2)	
		LFBGA168-1212	168				12.0 x 12.0 x (1.4) / (1.6)	
		TFBGA180-1212	180			12 x 12	12.0 x 12.0 x (1.2)	
		TFBGA184-1212	184					
		TFBGA240-1414	240			14 x 14	14.0 x 14.0 x (1.2)	
		LFBGA280-1616	280					
		LFBGA352-1616	352			16 x 16	16.0 x 16.0 x (1.5)	
		TFBGA064-0606	64			0.65	6 x 6	6.0 x 6.0 x (1.2)
		LFBGA144-0909	140				9 x 9	9.0 x 9.0 x (1.4)
		LFBGA160-1010	160				10 x 10	10.0 x 10.0 x (1.4) / (1.6)
TFBGA180-1313	180		13 x 13	13.0 x 13.0 x (1.2)				
LFBGA192-1010	192		10 x 10	10.0 x 10.0 x (1.4) / (1.6)				
LFBGA208-1212	208		12 x 12	12.0 x 12.0 x (1.4) / (1.6)				
LFBGA224-1313	224			13.0 x 13.0 x (1.4) / (1.6)				
(Plastic) TFBGA260-1313	260		13 x 13	13.0 x 13.0 x (1.2)				

* Figures in brackets indicate available terminal counts.

★Under development



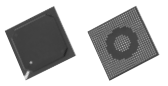


●Surface-mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package width & length x (seated height [MAX.]) mm		
FBGA (CSP)		VFBGA057-0505	57	0.5	5 x 5	5.0 x 5.0 x (0.9)		
		LFBGA064-0606	64		6 x 6	6.0 x 6.0 x (1.1)		
		TFBGA068-0606	68					
		VFBGA081-0606	81		7 x 7	6.0 x 6.0 x (0.9)		
		TFBGA084-0606	84			6.0 x 6.0 x (1.1)		
		VFBGA100-0606	100		6.0 x 6.0 x (0.9)			
		VFBGA100-0707			7.0 x 7.0 x (0.9)			
		TFBGA100-0707			7.0 x 7.0 x (1.1)			
		VFBGA108-0707	108		7.0 x 7.0 x (0.9)			
		TFBGA108-0707			7.0 x 7.0 x (1.1)			
		VFBGA120-0707	120		7.0 x 7.0 x (0.9)			
		TFBGA120-0707			7.0 x 7.0 x (1.1)			
		VFBGA144-0808	144		8.0 x 8.0 x (0.9)			
		LFBGA144-0808			8.0 x 8.0 x (1.3) / (1.5)			
		LFBGA144-0811			8.0 x 11.0 x (1.3)			
		TFBGA152-0808	152		8.0 x 8.0 x (1.1)			
		VFBGA171-0811	171		8.0 x 11.0 x (0.9)			
		LFBGA171-0811			8.0 x 11.0 x (1.3) / (1.5)			
		VFBGA176-0909	176		9.0 x 9.0 x (0.9)			
		TFBGA176-0909	180		9.0 x 9.0 x (1.1)			
		TFBGA180-0909			11 x 11	11.0 x 11.0 x (0.9)		
		VFBGA188-1111	188		9.0 x 9.0 x (1.1)			
		TFBGA188-0909			10.0 x 10.0 x (0.9)			
		VFBGA208-1010	208		10.0 x 10.0 x (1.1)			
		TFBGA208-1010			10.0 x 10.0 x (1.3)			
		TFBGA245-1010			14.0 x 14.0 x (1.8)			
		LFBGA245-1010	424		14 x 14			
		FBGA424-1414	(Plastic)		144	0.4	6 x 6	6.0 x 6.0 x (0.75)
		WFBGA144-0606			121		6 x 6	6.0 x 6.0 x (0.8)
		WFBGA121-0606			168		7 x 7	7.0 x 7.0 x (1.0)
TFBGA168-0707	204	8 x 8		8.0 x 8.0 x (1.0)				
TFBGA204-0808	205	8 x 8		8.0 x 8.0 x (0.8)				
★WFBGA205-0808								




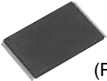


●Surface-mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package width & length x (seated height [MAX.]) mm	
FBGA (CSP)		TFBGAXXX-0606	to 36	0.8	6 x 6	6.0 x 6.0 x (1.2)	
		TFBGAXXX-0707	to 49		7 x 7	7.0 x 7.0 x (1.2)	
		TFBGAXXX-0808	to 81		8 x 8	8.0 x 8.0 x (1.2)	
		TFBGAXXX-0909	to 100		9 x 9	9.0 x 9.0 x (1.2)	
		TFBGAXXX-1010	to 121		10 x 10	10.0 x 10.0 x (1.2)	
		TFBGAXXX-1111	to 144		11 x 11	11.0 x 11.0 x (1.2)	
		TFBGAXXX-1212	to 196		12 x 12	12.0 x 12.0 x (1.2)	
		TFBGAXXX-1313	to 216		13 x 13	13.0 x 13.0 x (1.2)	
		TFBGAXXX-1414	to 240		14 x 14	14.0 x 14.0 x (1.2)	
		TFBGAXXX-1515	to 240		15 x 15	15.0 x 15.0 x (1.2)	
		TFBGAXXX-1616	to 352		16 x 16	16.0 x 16.0 x (1.2)	
		TFBGAXXX-0606	to 49		0.65	6 x 6	6.0 x 6.0 x (1.2)
		TFBGAXXX-0707	to 81			7 x 7	7.0 x 7.0 x (1.2)
		TFBGAXXX-0808	to 121			8 x 8	8.0 x 8.0 x (1.2)
		TFBGAXXX-0909	to 144			9 x 9	9.0 x 9.0 x (1.2)
		TFBGAXXX-1010	to 196			10 x 10	10.0 x 10.0 x (1.2)
		TFBGAXXX-1111	to 224	11 x 11		11.0 x 11.0 x (1.2)	
		TFBGAXXX-1212	to 256	12 x 12		12.0 x 12.0 x (1.2)	
		TFBGAXXX-1313	to 272	13 x 13		13.0 x 13.0 x (1.2)	
		TFBGAXXX-1414	to 304	14 x 14		14.0 x 14.0 x (1.2)	
		TFBGAXXX-1515	to 320	15 x 15		15.0 x 15.0 x (1.2)	
		TFBGAXXX-1616	to 352	16 x 16		16.0 x 16.0 x (1.2)	
		TFBGAXXX-0606	to 100	0.5		6 x 6	6.0 x 6.0 x (1.1)
		TFBGAXXX-0707	to 132			7 x 7	7.0 x 7.0 x (1.1)
		TFBGAXXX-0808	to 164			8 x 8	8.0 x 8.0 x (1.1)
		TFBGAXXX-0909	to 192			9 x 9	9.0 x 9.0 x (1.1)
		TFBGAXXX-1010	to 216			10 x 10	10.0 x 10.0 x (1.1)
		TFBGAXXX-1111	to 244		11 x 11	11.0 x 11.0 x (1.1)	
		TFBGAXXX-1212	to 268		12 x 12	12.0 x 12.0 x (1.1)	
		TFBGAXXX-1313	to 296		13 x 13	13.0 x 13.0 x (1.1)	
		TFBGAXXX-1414	to 320		14 x 14	14.0 x 14.0 x (1.1)	
		TFBGAXXX-1515	to 348		15 x 15	15.0 x 15.0 x (1.1)	
		TFBGAXXX-1616	to 372		16 x 16	16.0 x 16.0 x (1.1)	
TFBGAXXX-0505	to 100	0.4	5 x 5		5.0 x 5.0 x (1.0)		
TFBGAXXX-0606	to 144		6 x 6		6.0 x 6.0 x (1.0)		
TFBGAXXX-0707	to 168		7 x 7		7.0 x 7.0 x (1.0)		
TFBGAXXX-0808	to 204		8 x 8		8.0 x 8.0 x (1.0)		
TFBGAXXX-0909	to 228		9 x 9		9.0 x 9.0 x (1.0)		
TFBGAXXX-1010	to 264		10 x 10	10.0 x 10.0 x (1.0)			
TFBGAXXX-1010	(Plastic)		to 264	10 x 10	10.0 x 10.0 x (1.0)		
FLGA (LGA)	 (Plastic)		XFLGA100-0707	100	0.5	7 x 7	7.0 x 7.0 x (0.5)
PBGA (BGA)			PBGA0356-2121	356	1.0	21 x 21	21.0 x 21.0 x (2.2)
			PBGA0476-3535	476	1.27	35 x 35	35.0 x 35.0 x (2.63)
			PBGA0528-3535	528			

XXX: Terminal counts



●Surface-mount Type (cont'd)



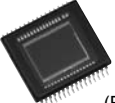
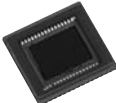
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm (mil)	Nominal dimensions mm (mil)	Package width & length x (seated height [MAX.]) mm	Lead frame material		
							Alloy42	Copper alloy	
SOP	 (Plastic)	P-SOP044-0600	44	1.27 (50)	15.2 (600)	13.2 x 28.2 x (3.1)	○	○	
SSOP		P-SSOP008-0150	8	0.65	4.5 (150)	3.0 x 3.0 x (1.1)	-	○	
		P-SSOP012-0225	12	0.75	5.7 (225)	4.4 x 5.0 x (1.8)	○	-	
		P-SSOP024-0275	24	0.65	7.0 (275)	6.0 x 7.8 x (1.27)	-	○	
		P-SSOP040-0300	40		7.6 (300)	6.3 x 13.5 x (1.8)	-	○	
		P-SSOP070-0500	70	0.8	12.7 (500)	12.7 x 28.6 x (3.05)	-	○	
MFP		P-MFP018	18	0.8	-	6.0 x 7.5 x (1.8)	○	-	
		P-MFP020	20	0.75	-		○	-	
TSOP		 (Plastic)	P-TSOP040-1020	40	0.5	10 x 20	10.0 x 18.4 x (1.2)	○	○
			P-TSOP048-1220	48		12 x 20	12.0 x 18.4 x (1.2)	○	○
	P-TSOP056-1420		56	14 x 20		14.0 x 18.4 x (1.2)	○	○	
QFP	 (Plastic)	P-QFP048-0707	48	0.5	7 x 7	7.0 x 7.0 x (1.65)	○	-	
		P-QFP048-1010		0.75	10 x 10	10.0 x 10.0 x (1.82)	○	-	
		P-QFP064-1010	64	0.5		10.0 x 10.0 x (1.8)	○	-	
		P-QFP072-1010	72				○	-	
		P-QFP128-1420	128	0.4	14 x 20	14.0 x 20.0 x (2.3)	○	-	
		P-QFP156-1420	156				○	-	
LQFP		P-LQFP080-1212	80	0.5	12 x 12	12.0 x 12.0 x (1.7)	○	-	
		P-LQFP100-1414	100		14 x 14	14.0 x 14.0 x (1.7)	○	-	
		P-LQFP144-2020	144		20 x 20	20.0 x 20.0 x (1.7)	-	○	
		P-LQFP176-2424	176		24 x 24	24.0 x 24.0 x (1.7)	-	○	
TQFP		P-TQFP048-0707	48	0.5	7 x 7	7.0 x 7.0 x (1.2)	○	-	
		P-TQFP100-1414	100		14 x 14	14.0 x 14.0 x (1.2)	○	-	
	P-TQFP128-1414	128	0.4	○			-		
VQFN	 (Plastic)	P-VQFN020-0404	20	0.5			4 x 4	4.2 x 4.2 x (1.0)	-
		P-VQFN028-0505	28		5 x 5	5.2 x 5.2 x (1.0)	-	○	
		P-VQFN032-0505	32		6 x 6	6.2 x 6.2 x (1.0)	-	○	
		P-VQFN036-0606	36		7 x 7	7.2 x 7.2 x (1.0)	-	○	
		P-VQFN048-0707	48	0.4	5 x 5	5.2 x 5.2 x (1.0)	-	○	
		P-VQFN036-0505	36		7 x 7	7.2 x 7.2 x (1.0)	-	○	
		P-VQFN052-0707	52		8 x 8	8.2 x 8.2 x (1.0)	-	○	
		P-VQFN064-0808	64		8 x 8	8.2 x 8.2 x (1.0)	-	○	
HQFN*		P-HQFN020-0404	20	0.5	4 x 4	4.0 x 4.0 x (1.0)	-	○	
		P-HQFN024-0404	24			4.0 x 4.0 x (0.85)	-	○	
		P-HQFN028-0505	28		5 x 5	5.0 x 5.0 x (1.0)	-	○	
		P-HQFN052-0707	52		7 x 7	7.2 x 7.2 x (1.0)	-	○	

* HQFN is a higher heat dissipation package of VQFN.

100 mil = 2.54 mm

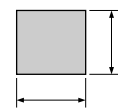


●For CCDs

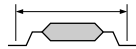
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm (mil)	Package width & length x (seated height) mm
DIP	 (Plastic)	P-DIP014-0400A	14	1.27	10.16 (400)	10.0 x 10.0
		P-DIP016-0500C	16	1.78	12.7 (500)	12.4 x 14.0
		P-DIP020-0400	20	1.00	10.16 (400)	10.0 x 10.0
	 (Ceramic)	N-DIP016-0450	16	1.27	11.43 (450)	11.4 x 12.2
		N-DIP016-0500C		1.78	12.7 (500)	12.4 x 14.0
SOP	 (Plastic)	P-SOP028-0400	28	0.69	10.16 (400)	10.0 x 10.0 x (3.5)
		P-SOP032-0525	32	0.78	13.3 (525)	12.0 x 13.8 x (3.9)
LCC	 (Ceramic)	N-LCC028-S450A	28	0.80	11.5	11.5 x 11.5 x (1.62)
		N-LCC032-R543	32	0.80	13.8	12.9 x 13.8 x (1.35)
		N-LCC040-S433A	40	0.80	11.0	11.0 x 11.0 x (1.62)

100 mil = 2.54 mm

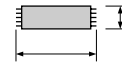
Nominal dimensions



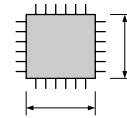
FBGA (CSP)
FLGA (LGA)
PBGA (BGA)



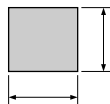
SOP
SSOP
MFP



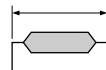
TSOP



QFP
LQFP
TQFP



VQFN
HQFN



DIP









LCC

FBGA : fine-pitch ball grid array package
FLGA : fine-pitch land grid array package
PBGA : plastic ball grid array package
SOP : small outline package
SSOP : shrink small outline package
MFP : mini flat package
TSOP : thin small outline package

QFP : quad flat package
LQFP : low profile quad flat package
TQFP : thin quad flat package
VQFN : very thin quad flat non-leaded package
HQFN : heat sink quad flat non-leaded package
DIP : dual inline package
LCC : leadless chip carrier







●Lead-inserting Type Packages [For regulators: PQ series]

Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Thickness x Height) mm	Lead frame material
TO-220 (Heat sink exposure) [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 3.5 x 25.2* ²	Cu
TO-220	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1* ²	Cu
TO-220 (Full mold)	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1* ²	Cu
TO-220 (Full mold) [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu
TO-220 [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu
TO-220 [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu
TO-92	 (Plastic)	3	2.5	5.2 (MAX.) x 4.2 (MAX.) x 18.2 (MAX.)* ²	Cu

*1 The figure in parentheses indicates reference value.

*2 Including lead length

●Surface-mount Type Packages [For regulators/LED drivers: PQ series]








Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
TO-263	 (Plastic)	5 (Heat sink not included)	(1.7)* ¹	10.6 (MAX.) x 13.7 (MAX.)* ² x 3.5	Cu
SC-63	 (Plastic)	5 (Heat sink not included)	(1.27)* ¹	6.6 (MAX.) x 9.7 (MAX.)* ² x 2.3	Cu
SC-63	 (Plastic)	5 (Heat sink included)	(1.27)* ¹	6.6(MAX.) x 9.7 (MAX.)* ² x 2.1	Cu
SOP-8	 (Plastic)	8	1.27	5 x 6.2* ² x 1.55* ²	Cu

*1 The figure in parentheses indicates reference value.

*2 Including lead length



●Surface-mount Type Packages [For regulators/LED drivers: PQ series] (cont'd)

Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
SOT-89	 (Plastic)	6	1.5	4.5 x 4.3*2 x 1.5	Cu
SOT-23-6	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-6W	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-L	 (Plastic)	6	(0.95)*1	(3.4)*1 x 3.3*2 x 1.4 (MAX.)	Cu
SOT-23-5	 (Plastic)	5	(0.95)*1	(2.9)*1 x 2.8*2 x 1.3 (MAX.)	Cu
USB-6		6	0.5	2.0 x 1.8 x 0.8	Cu (Terminal material)/ Au plating (Terminal finish)
USB-10		10	0.5	2.8 x 2.0 x 0.8	—

*1 The figure in parentheses indicates reference value.

*2 Including lead length

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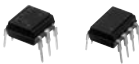


■ Photocoupler Lineup

<Phototransistor output type>

Package type	Output type	Features	Model No. (series)	Page		
4-pin SOP Compact, SMT type 	Single phototransistor	General purpose, High collector-emitter voltage, etc.	PC35x series/PC451J00000F	75		
		AC input response	Low input current PC367NJ0000F	75		
			PC354NJ0000F	75		
	Darlington phototransistor	High sensitivity, High collector-emitter voltage	Low input current PC364NJ0000F	75		
			PC355NJ0000F	75		
			Low input current PC365NJ0000F	75		
Compact, Half pitch (lead space), SMT type 	Single phototransistor	General purpose, High collector-emitter voltage, etc.	PC3Hx series/PC3HU series	76		
			Low input current PC3H71xNIP0F	76		
		High collector-emitter voltage	PC4H510NIP0F	76		
		AC input response	PC3H3J00000F/PC3H4J00000F	76		
	Darlington phototransistor	General purpose	Low input current PC3H41xNIP0F	76		
			PC3H5J00000F	76		
			Low input current PC3H510NIP0F	76		
		High collector-emitter voltage	PC4H520NIP0F▲	76		
			Isolation thickness: 0.4 mm or more Creepage distance: 6.4 mm or more	PC123J00000F series	77	
			Approved by safety standards other than UL	Low input current PC1231xNSZ0F	77	
DIP type (4/16-pin) 	Single phototransistor	General purpose, High collector-emitter voltage, etc.	PC817XJ0000F/PC847XJ0000F/ PC851XJ0000F	77		
			Low input current PC817xxNSZ0F	77		
		AC input response	PC814XJ0000F/PC844XJ0000F	77		
			Low input current PC8141xNSZ0F	77		
	Darlington phototransistor	Built-in SBD/High response speed	PC81100NSZ0F	77		
		General purpose, High collector-emitter voltage	PC815XJ0000F/PC845XJ0000F/ PC852XJ0000F/PC853XJ0000F	77		
			Low input current PC81510NSZ0F	77		
		DIP type (6-pin) 	Single phototransistor	General purpose, High collector-emitter voltage, etc.	PC7xxV0NSZXF	78
			Darlington phototransistor	General purpose, High collector-emitter voltage, etc.	PC7x5V0NSZXF	78

<OPIC output type>

Package type	Output type	Features	Model No. (series)	Page
Compact, SMT type 	Digital output	General purpose, High response speed, 2ch, etc.	PC4xxJ00000F/PC456L0NIP0F/ PC41xS0NIP0F/PC410L0NIP0F/ PC411L0NIP0F/PC4D10SNIP0F	79
	Analog/Digital output	High CMR	PC457S0NIP0F/PC457L0NIP0F	80
DIP type, SMT type 	Digital output	General purpose, High response speed, etc.	PC9xxV0NSZXF/PC956L0NSZ0F/ PC910L0NSZ0F/PC911L0NSZ0F/ PC912L0NSZ0F▲	80
	Built-in base amplifier	For inverter control/For inverter control, Built-in short-circuit protection circuit	PC942J00000F/PC92xL0NSZ0F series	81
	Analog/Digital output	High speed, High CMR, etc.	PC957L0NSZ0F	81

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



■ Photocouplers

◆ Phototransistor Output Type

<Compact, SMT type>

○: Approved, △: Under application

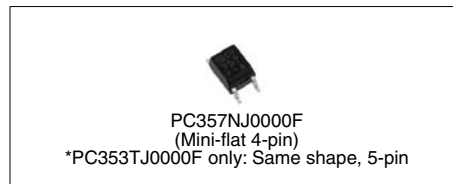
(Ta = 25°C)

Output Type	Model No.	Internal connection diagram	Features	Approved by safety standards*2	Package	Absolute maximum ratings			Electro-optical characteristics						
				UL		Forward current I _F (mA)	Isolation voltage (AC) Viso (rms) (kV)	Collector-emitter voltage V _{CEO} (V)	Current transfer ratio			Response time			
									CTR (%) MIN.	I _F (mA)	V _{CE} (V)	t _r (μs) TYP.	I _C (mA)	R _L (Ω)	V _{CE} (V)
Single phototransistor output	PC357NJ0000F		General purpose	○*	Mini-flat 4-pin	50	3.75	80	50	5	5	4	2	100	2
	PC352NJ0000F		General purpose, high resistance to noise*1	○		50	3.75	80	90	5	5	4	2	100	2
	PC451J00000F		High collector-emitter voltage	○*		50	3.75	350	40	5	5	4	2	100	2
	PC367NJ00000F		Low input current, high resistance to noise*1	○		10	3.75	80	100	0.5	5	4	2	100	2
	PC354NJ00000F		AC input response	○*		±50	3.75	80	20	±1	5	4	2	100	2
	PC364NJ00000F		Low input current, AC input response, high resistance to noise*1	○		±10	3.75	70	50	±0.5	5	4	2	100	2
Darlington photo-transistor output	PC355NJ0000F		High sensitivity	○*	50	3.75	35	600	1	2	60	2	100	2	
	PC365NJ0000F		High sensitivity, low input current	○	10	3.75	35	600	0.5	2	60	2	100	2	

*1 CMR: MIN.10 kV/μs

*2 Please refer to Specification Sheets for model numbers approved by safety standards.

* A VDE approved type is optionally available.



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★Under development



◆ Phototransistor Output Type <Compact, half pitch (lead space) SMT type>

○: Approved, △: Under application

(Ta = 25°C)

Type	Model No.	Internal connection diagram	Features	Approved by safety standards*3	Package	Absolute maximum ratings			Electro-optical characteristics						
				UL		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Collector-emitter voltage V _{CEO} (V)	Current transfer ratio			Response time			
									CTR (%) MIN.	I _F (mA)	V _{CE} (V)	t _r (μs) TYP.	I _C (mA)	R _L (Ω)	V _{CE} (V)
Single phototransistor output	★PC3HU7NYIP0F		Reinforced insulation (internal insulation distance: MIN. 0.4 mm), low-profile package	○*4, 5	Low-profile mini-flat 4-pin	50	3.75	80	50	5	5	4	2	100	2
	PC3H2J00000F		High resistance to noise*1	○	Mini-flat 4-pin	50	2.5	80	20	1	5	4	2	100	2
	PC3H7J00000F		Standard	○*2		50	2.5	80	20	1	5	4	2	100	2
	PC3H71xNIP0F		High resistance to noise*1, low input current	○		10	2.5	80	100	0.5	5	4	2	100	2
	PC3H3J00000F		AC input response, high resistance to noise*1	○		±50	2.5	80	20	±1	5	4	2	100	2
	PC3H4J00000F		AC input response	○*2		±50	2.5	80	20	±1	5	4	2	100	2
	PC3H41xNIP0F		AC input response, high resistance to noise*1, low input current	○		±10	2.5	80	50	±0.5	5	4	2	100	2
	PC4H510NIP0F		High collector-emitter voltage	○		50	2.5	350	40	5	5	4	2	100	2
Darlington photo-transistor output	PC3H5J00000F		High sensitivity	○*2		Mini-flat 4-pin	50	2.5	35	600	1	2	60	2	100
	PC3H510NIP0F		High sensitivity, low input current	○	10		2.5	35	600	0.5	2	60	2	100	2
	PC4H520NIP0F▲		High collector-emitter voltage	○	50		2.5	350	1 000	1	2	100	2	100	2

*1 CMR: MIN.10 kV/μs

*2 A VDE approved type is optionally available.

*3 Please refer to Specification Sheets for model numbers approved by safety standards.

*4 VDE, CSA approved

*5 In conformance with BSI, SEMKO, DEMKO, NEMKO, and FIMKO

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◆ Phototransistor Output Type <DIP type (4/16-pin)>

○: Approved, △: Under application

(Ta = 25°C)

Output Type	Model No.	Internal connection diagram	Features	Approved by safety standards*8			Package	Absolute maximum ratings			Electro-optical characteristics				
				UL	VDE *2	Others *3		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Collector-emitter voltage V _{CEO} (V)	Current transfer ratio CTR (%) MIN.	I _F (mA)	t _r (μs) TYP.	R _L (Ω)	
Single phototransistor output	PC123J0000F*1		High isolation voltage, long creepage distance	○	○	○	4-pin DIP	50	5.0	70	50	5	4	100	
	PC1231xNSZ0F		High isolation voltage, long creepage distance, low input current, high resistance to noise*4	○	○	-		10	5.0	70	50	0.5	4	100	
	PC817XJ0000F*5, *6, *7		High isolation voltage	○	○	-		50	5.0	80	50	5	4	100	
	PC847XJ0000F*5, *9		High isolation voltage (4-ch)	○	○	-	16-pin DIP	50	5.0	80	50	5	4	100	
	PC8171xNSZ0F		High isolation voltage, low input current, high resistance to noise*4	○	-	-	4-pin DIP	10	5.0	70	100	0.5	4	100	
	PC851XJ0000F		High isolation voltage, high collector-emitter voltage	○	-	-		50	5.0	350	40	5	4	100	
	PC814XJ0000F*5, *6		High isolation voltage, AC input response	○	○	-	4-pin DIP	±50	5.0	80	20	±1	4	100	
	PC844XJ0000F		High isolation voltage, AC input response (4-ch)	○	○	-		16-pin DIP	±50	5.0	80	20	±1	4	100
	PC8141xNSZ0F		High isolation voltage, AC input response, low input current, high resistance to noise*4	○	-	-		4-pin DIP	±10	5.0	80	50	±0.5	4	100
PC81100NSZ0F		Built-in schottky barrier diode, toff: 35μs TYP. (In saturation, R _L = 100kΩ)	○	-	-	4-pin DIP	50	5.0	70	50	5	ton: TYP. 9	100		
Darlington phototransistor output	PC815XJ0000F		High isolation voltage, high sensitivity	○	-	-	4-pin DIP	50	5.0	35	600	1	60	100	
	PC845XJ0000F		High isolation voltage, high sensitivity (4-ch)	○	-	-	16-pin DIP	50	5.0	35	600	1	60	100	
	PC81510NSZ0F		High isolation voltage, high sensitivity, low input current	○	-	-	4-pin DIP	10	5.0	35	600	0.5	60	100	
	PC852XJ0000F*5, *6		High isolation voltage, high collector-emitter voltage	○	○	-		50	5.0	350	1 000	1	100	100	
	PC853XJ0000F*5, *6		High isolation voltage, high collector-emitter voltage	○	○	-		50	5.0	350	1 000	1	100	100	

*1 Wide lead spacing type (F type) is also available. Creepage distance PC123: 6.4 mm or more, PC123F: 8 mm or more

*2 Optionally available.

*3 BSI, SEMKO, DEMKO, NEMKO, FIMKO, CSA

*4 CMR: 10 kV/μs MIN.

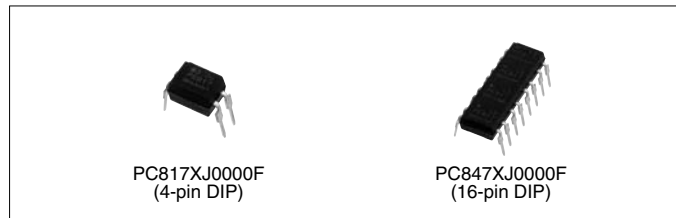
*5 Lead forming type (I type) is also available for surface mounting.

*6 Taped package of lead forming type for surface mounting is also available.

*7 Wide lead spacing type (F type) is also available. Lead forming type (FI type) of F type is also available. Taped package is also available for I and FI type of lead forming type.

*8 Please refer to Specification Sheets for model numbers approved by safety standards.

*9 Approved by UL as multi-channel type of PC817.



PC817XJ0000F
(4-pin DIP)

PC847XJ0000F
(16-pin DIP)

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◆ Phototransistor Output Type <DIP type (6-pin)>

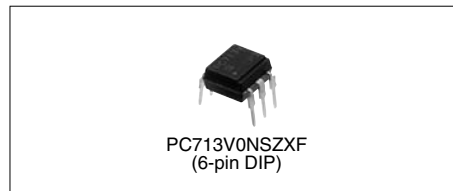
○: Approved, △: Under application

(Ta = 25°C)

Output Type	Model No.	Internal connection diagram	Features	Approved by safety standards*2		Package	Absolute maximum ratings			Electro-optical characteristics			
				UL	VDE*1		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Collector-emitter voltage V _{CEO} (V)	Current transfer ratio		Response time	
										CTR (%) MIN.	I _F (mA)	t _r (μs) TYP.	R _L (Ω)
Darlington phototransistor output (Single phototransistor output)	PC714V0NSZXF		High isolation voltage	○	○	6-pin DIP	50	5.0	80	50	5	4	100
	PC724V0NSZXF		High isolation voltage, large input current	○	—		150	5.0	35	20	100	4	100
	PC713V0NSZXF	High isolation voltage, with base terminal	○	○	50		5.0	80	50	5	4	100	
	PC715V0NSZXF	High isolation voltage, high sensitivity	○	○	50		5.0	35	600	1	60	100	
	PC725V0NSZXF	High isolation voltage, high sensitivity, high collector-emitter voltage, high power	○	○	50		5.0	300	1 000	1	100	100	

*1 Optionally available.

*2 Please refer to Specification Sheets for model numbers approved by safety standards.



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◆ **OPIC Output** (“OPIC” (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<Compact, SMT type> (1-1)

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*2		Package	Absolute maximum ratings		Electro-optical characteristics*1						
			UL	VDE*3		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Low level output voltage			Threshold input current			
								V _{OL} (V) MAX.	T _a (°C)	I _{oL} (mA)	I _F (mA)	I _{FHL} (mA) MAX.	I _{FLH} (mA) MAX.	R _L (Ω)
PC400J0000F		Digital output, normal-off operation	○	—	Mini-flat 5-pin	50	3.75	0.4	0 to +70	16	4	2.0	—	280
PC401J0000F		Digital output, normal-on operation	○	—		50	3.75	0.4	0 to +70	16	0	—	2.0	280
PC456L0NIP0F		Built-in preamplifier, high speed transmission (2 Mb/s), For flow soldering	○	○		25	3.75	0.6	−40 to +85	4.4	10	5.0	—	20 k
PC410L0NIP0F		High speed (10 Mb/s), High CMR (10 kV/μs), For flow soldering	○	○	SOP 8-pin	20	3.75	0.6	−40 to +85	13	5	5.0	—	350
PC410S0NIP0F		High speed (10 Mb/s), High CMR (10 kV/μs), For flow soldering, Solder heat resistance: 270°C	○	○		20	3.75	0.6	−40 to +85	13	5	5.0	—	350
PC412S0NIP0F		High speed (25 Mb/s), High CMR (10 kV/μs), For flow soldering, Solder heat resistance: 270°C	○	—		—*4	3.75	1	−40 to +85	4	V _{IN} = V _{IL}	—	—	—
PC411L0NIP0F		High speed (15 Mb/s), High CMR (10 kV/μs), For flow soldering	○	○	Mini-flat 5-pin	20	3.75	0.1	−40 to +85	0.02	12	6.0	—	—
PC411S0NIP0F		High speed (15 Mb/s), High CMR (10 kV/μs), For flow soldering, Solder heat resistance: 270°C	○	○	SOP 8-pin	20	3.75	0.1	−40 to +85	0.02	12	6.0	—	—
PC4D10SNIP0F		High speed (10 Mb/s), For flow soldering, Solder heat resistance: 270°C 2ch output	○	—		20	3.75	0.6	−40 to +85	13	5	5.0	—	—

A: Rated voltage circuit

*1 Each item is measured at V_{cc}=5V. (PC400, PC401)

*2 Please refer to Specification Sheets for model numbers approved by safety standards.

*3 Optionally available.

*4 No forward current rating for voltage input (rated input voltage: −0.5 to 6.0 V).

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<Compact, SMT type> (1-2)

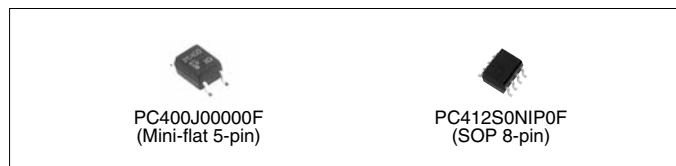
○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*1		Package	Absolute maximum ratings		Electro-optical characteristics							
			UL	VDE*2		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Current transfer ratio				Propagation delay time			
								CTR (%) MIN.	I _F (mA)	V _O (V)	V _{CC} (V)	t _{PHL} (μs) TYP.	t _{PLH} (μs) TYP.	R _L (Ω)	I _F (mA)
PC457L0NIP0F		High speed (1 Mb/s), high CMR (15 kV/μs), For flow soldering	○	○	Mini-flat 5-pin	25	3.75	19	16	0.4	4.5	0.2	0.6	1 900	16
PC457S0NIP0F		High speed (1 Mb/s), high CMR (15 kV/μs), For flow soldering, Solder heat resistance: 270°C	○	○	SOP 8-pin	25	3.75	19	16	0.4	4.5	0.2	0.6	1 900	16

*1 Please refer to Specification Sheets for model numbers approved by safety standards.

*2 Optionally available.



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<DIP type, digital output>

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*6		Package	Absolute maximum ratings		Electro-optical characteristics*1						
			UL	VDE*4		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Low level output voltage			Threshold input current			
								V _{OL} (V) MAX.	T _a (°C)	I _{OL} (mA)	I _F (mA)	I _{FHL} (mA) MAX.	I _{FLH} (mA) MAX.	R _L (Ω)
PC900V0NSZXF*2, *3		Digital output, normal-off operation	○	○	6-pin DIP	50	5.0	0.4	0 to +70	16	4	2.0	-	280
PC901V0NSZXF		Digital output, normal-on operation	○	○		50	5.0	0.4	0 to +70	16	0	-	2.0	280
PC956L0NSZ0F		Built-in preamplifier, high speed transmission (2 Mb/s) For soldering flow	○	○	8-pin DIP	25	5.0	0.6	-40 to +85	2.4	10	5.0	-	20 k
PC910L0NSZ0F		Digital output, High speed (10 Mb/s), high CMR (20 kV/μs) For soldering flow	○	○		20	5.0	0.6	-40 to +85	13	5	5.0	-	350
PC911L0NSZ0F		High speed (15 Mb/s), high CMR (10 kV/μs), For soldering flow	○	○		20	5.0	0.1	-40 to +85	0.02	12	6.0	-	-
PC912L0NSZ0F▲		Digital output, High speed (25 Mb/s), high CMR (20 kV/μs)	○	○		-*5	5.0	1.0	-40 to +85	4	V _{IN} = V _{IL}	-	-	-

A: Rated voltage circuit

*1 Each item is measured at V_{CC}=5V.

*3 Taped package of lead forming type for surface mounting is also available.

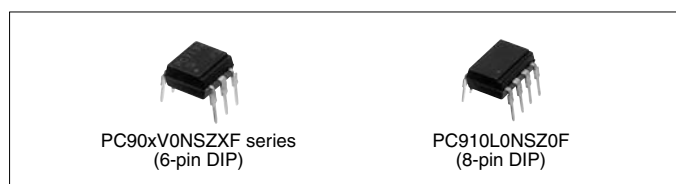
*5 No forward current rating due to voltage input. (rated input voltage: -0.5 to 6.0 V)

*6 Please refer to Specification Sheets for model numbers approved by safety standards.

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

*2 Lead forming type (I type) is also available for surface mounting.

*4 Optionally available.



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<DIP type, Gate drive type>

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*3		Package	Absolute maximum ratings			Electro-optical characteristics					
			UL	VDE*2		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Output current I _{O1} (A)	Propagation delay time					
									t _{PHL} (μs) TYP.	t _{PLH} (μs) TYP.	V _{CC} (V)	I _F (mA)	R _{L1} (Ω)	R _{L2} (Ω)
PC942J0000F		For controlling inverter-controlled air-conditioner	○	○	8-pin DIP	25	5.0	0.5	2.0	2.0	6	5	5	10
PC923L0NSZ0F*1		<ul style="list-style-type: none"> Built-in drive circuit directly connectable to MOS-FET and IGBT Low dissipation current (I_{CC} = TYP. 1.3 mA) High resistance to noise (CMR: MIN. 15 kV/μs) 	○	○		20	5.0	0.1	0.3	0.3	24	5	R _G = 47	-
PC924L0NSZ0F*1		<ul style="list-style-type: none"> Built-in drive circuit directly connectable to MOS-FET and IGBT Low dissipation current (I_{CC} = TYP. 1.3 mA) High resistance to noise (CMR: MIN. 15 kV/μs) 	○	○		25	5.0	0.1	1.0	1.0	24	10	R _G = 47	-
PC925L0NSZ0F		<ul style="list-style-type: none"> Built-in drive circuit directly connectable to MOS-FET and IGBT Peak output current: 2.5 A Low dissipation current (I_{CC} = TYP. 5 mA) High resistance to noise (CMR: MIN. 15 kV/μs) 	○	-		25	5.0	2.5	MAX. 0.5	MAX. 0.5	24	10	R _G = 10	-

*1 Lead forming type (I type) is also available for surface mounting. Taped package of lead forming type for surface mounting is also available.

*2 A VDE approved type is optionally available.

*3 Please refer to Specification Sheets for model numbers approved by safety standards.

◆OPIC Output

<DIP type, analog/digital output>

○: Approved, △: Under application

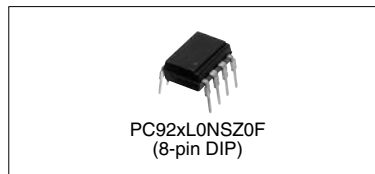
(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*3		Package	Absolute maximum ratings		Electro-optical characteristics							
			UL	VDE*2		Forward current I _F (mA)	Isolation voltage (AC) V _{iso} (rms) (kV)	Current transfer ratio			Propagation delay time*1				
								CTR (%) MIN	I _F (mA)	V _O (V)	V _{CC} (V)	t _{PHL} (μs) TYP.	t _{PLH} (μs) TYP.	R _L (Ω)	I _F (mA)
PC957L0NSZ0F		High speed (1 Mb/s), high CMR (15 kV/μs), for flow soldering	○	○	8-pin DIP	25	5.0	19	16	0.4	4.5	0.2	0.6	1 900	16

*1 V_{CC} = 5V

*2 Optionally available.

*3 Please refer to Specification Sheets for title(s) of safety standards.



Notice




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■ Phototriac Coupler Lineup

Package	Applied voltage	ON-state current (rms)	Features	Model No.	Page		
Mini-flat (SMD) 	AC 200 V lines (V _{DRM} = 600V)	0.05 A	General purpose	S2S3000F*4 / S2S5A00F*4	83		
			Built-in zero-cross circuit	S2S4000F*4	84		
DIP type (4-pin) 	AC 200 V lines (V _{DRM} = 600V)	0.1 A	General purpose	PC3ST11NSZAF	83		
			Built-in zero-cross circuit	PC3ST21NSZBF*3	84		
			Reinforced isolation	PC3SH11YFZAF*4 / PC3SH13YFZAF*4	83		
			Built-in zero-cross circuit	PC3SH21YFZBF*3	84		
DIP type (6-pin) 	AC 100 V lines (V _{DRM} = 400V)	0.1 A	General purpose (5th-pin cut)	PC2SD11NTZAF*4	83		
			AC 200 V lines (V _{DRM} = 600V)	0.1 A	General purpose (5th-pin cut)	PC3SD12NTZAF*4 / PC3SD11NTZAF*4 / PC3SD11NTZBF*3 / PC3SD11NTZCF*2 / PC3SD11YTZDF*1 / PC3SD21YTZEF*5	83/84
	Built-in zero-cross circuit	PC3SD21NTZAF*4 / PC3SD21NTZBF*3 / PC3SD21NTZCF*2 / PC3SD21NTZDF*1 / PC3SD23YTZCF*2			84		
	Reinforced isolation (5th-pin cut)	PC3SF11YVZAF*4 / PC3SF11YVZBF*3			83		
	Built-in zero-cross circuit	PC3SF21YVZAF*4 / PC3SF21YVZBF*3 / PC3SF23YVZSF*3			84		
	AC 200 V lines (V _{DRM} = 800V)	0.1 A			General purpose	PC4SD11NTZBF*3 / PC4SD11NTZCF*2	83
					Built-in zero-cross circuit	PC4SD21NTZCF*2 / PC4SD21NTZDF*1	84
	Reinforced isolation	PC4SF11YVZAF*4 / PC4SF11YVZBF*3	83				
Built-in zero-cross circuit	PC4SF21YVZBF*3 / PC4SF21YVZCF*2	84					

Minimum trigger current: *1 I_{FT} ≤ 3 mA, *2 I_{FT} ≤ 5 mA, *3 I_{FT} ≤ 7 mA, *4 I_{FT} ≤ 10 mA, *5 I_{FT} ≤ 2 mA
 The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

PHOTOTRIAC COUPLERS



Phototriac Couplers

○: Approved, △: Under application

(Ta = 25°C)

Type	Model No.	Internal connection diagram	Features	Approved by safety standards*4			Package	Absolute maximum ratings			Electro-optical characteristics			
				UL	VDE	Others*5		ON-state current I _T (rms) (A)	Repetitive peak OFF-state voltage V _{DRM} (V)	Isolation voltage (AC) V _{iso} (rms) (kV)	Min. trigger current I _{FT} (mA) MAX.	V _D (V)	R _L (Ω)	
For triggering	S2S3000F		200 V lines, compact	○	○*6	○	Mini-flat 4-pin	0.05	600	3.75	10	6	100	
	S2S5A00F		200 V lines, compact	○	○*6	○					10	6	100	
	PC3ST11NSZAF		200 V lines, compact	○	○*6	○	4-pin DIP	0.1	600	5.0	10	6	100	
	PC3SH11YFZAF		200 V lines, compact, reinforced isolation	○	○	○*2					10	6	100	
	PC3SH13YFZAF		200 V lines, compact, reinforced isolation, High noise resistance	○	○	○*2					10	6	100	
	PC2SD11NTZAF*7		100 V lines	○	—	○	6-pin DIP*1, 3	0.1	400	5.0	10	6	100	
	PC3SD12NTZAF*8		200 V lines	○	○*6	○					10	6	100	
	PC3SD11NTZAF		200 V lines	○	○*6	○					600	10	6	100
	PC3SD11NTZBF		200 V lines	○	○*6	○					7	6	100	
	PC4SD11NTZBF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	○					800	7	6	100
	PC3SD11NTZCF		200 V lines	○	○*6	○					600	5	6	100
	PC3SD11YTZDF		200 V lines, low input drive	○	○	○					3	6	100	
	PC4SD11NTZCF		200 V lines, repetitive peak-OFF-state voltage	○	○*6	○					800	5	6	100
	PC3SF11YVZAF		200 V lines, reinforced isolation	○	○	○*2					600	10	6	100
	PC3SF11YVZBF		200 V lines, reinforced isolation	○	○	○*2					7	6	100	
	PC4SF11YVZAF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2					800	10	6	100
	PC4SF11YVZBF		200 V lines, reinforced isolation, repetitive peak-OFF-state voltage	○	○	○*2					7	6	100	

For the notes *1 to *9, see next page.

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★Under development



■ Phototriac Couplers (cont'd)

○: Approved, △: Under application

(Ta = 25°C)

Type	Model No.	Internal connection diagram	Features	Approved by safety standards*4			Package	Absolute maximum ratings			Electro-optical characteristics		
				UL	VDE	Others*5		ON-state current I _T (rms) (A)	Repetitive peak OFF-state V _{DRM} (V)	Isolation voltage (AC) V _{iso} (rms) (kV)	Min. trigger current I _{FT} (mA) MAX.	V _D (V)	R _L (Ω)
For triggering	S2S4000F		200 V lines, compact, built-in zero-cross circuit	○	○*6	○	Mini-flat 4-pin	0.05	600	3.75	10	6	100
	PC3ST21NSZBF		200 V lines, compact, built-in zero-cross circuit	○	○*6	○	4-pin DIP	0.1	600	5.0	7	4	100
	PC3SH21YFZBF		200 V lines, compact, reinforced isolation, built-in zero-cross circuit	○	○	○*2		0.1	600	5.0	7	4	100
	★PC3SD21NTZAF		200 V lines, low zero-cross voltage: MAX. 20 V, built-in zero-cross circuit	○		○	6-pin DIP*1,3	0.1	600	5.0	10	4	100
	PC3SD21NTZBF		200 V lines, low zero-cross voltage: MAX. 20 V, built-in zero-cross circuit	○	○*6	○		0.1	600	5.0	7	4	100
	PC3SD21NTZCF*9		200 V lines, low zero-cross voltage: MAX. 20 V, built-in zero-cross circuit	○	○*6	○		0.1	600	5.0	5	4	100
	PC3SD23YTZCF		200 V lines, built-in zero-cross circuit, High pulse/noise resistance (TYP. 2 kV)	○	○	○		0.1	600	5.0	5	4	100
	PC3SD21NTZDF		200 V lines, low zero-cross voltage: MAX. 20 V, built-in zero-cross circuit	○	○*6	○		0.1	600	5.0	3	4	100
	PC3SD21YTZEF		200 V lines, built-in zero-cross circuit, Low input drive	○	○	○		0.1	600	5.0	2	4	100
	PC4SD21NTZCF		200 V lines, built-in zero-cross circuit, repetitive peak-OFF-state voltage	○	○*6	○		0.1	800	5.0	5	4	100
	PC4SD21NTZDF		200 V lines, built-in zero-cross circuit, repetitive peak-OFF-state voltage	○	○*6	○		0.1	800	5.0	3	4	100
	PC3SF21YVZAF		200 V lines, reinforced isolation, built-in zero-cross circuit	○	○	○*2		0.1	600	5.0	10	4	100
	PC3SF21YVZBF		200 V lines, reinforced isolation, built-in zero-cross circuit	○	○	○*2		0.1	600	5.0	7	4	100
	PC3SF23YVZSF		200 V lines, reinforced isolation, built-in zero-cross circuit, High pulse/noise resistance (TYP. 2 kV)	○	○	○*2		0.1	600	5.0	7	4	100
	PC4SF21YVZBF		200 V lines, reinforced isolation, built-in zero-cross circuit, repetitive peak-OFF-state voltage	○	○	○*2		0.1	800	5.0	7	4	100
PC4SF21YVZCF	200 V lines, reinforced isolation, built-in zero-cross circuit, repetitive peak-OFF-state voltage		○	○	○*2	0.1		800	5.0	5	4	100	

*1 Lead forming type for surface mounting is also available.

*2 In conformance with BSI, SEMKO, DEMKO, NEMKO, and FIMKO

*3 These are molded pin No. 5.

*4 Please refer to Specification Sheets for model numbers approved by safety standards.

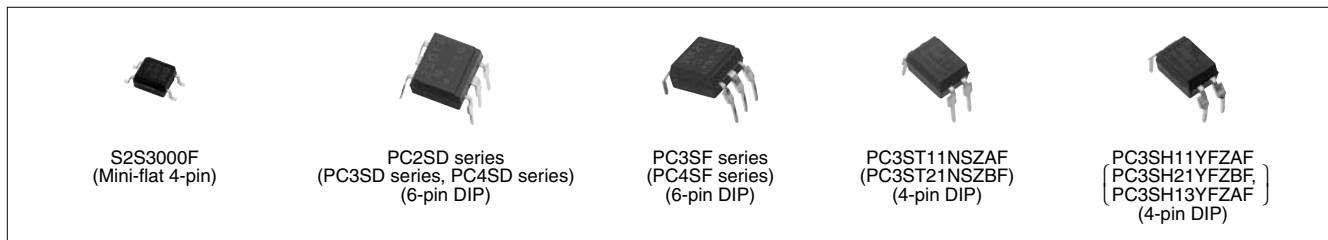
*5 CSA approval

*6 Optionally available

*7 An equivalent model (I_{FT} MAX.: 15 mA) with overseas brand compatibility is also available. (PC1S3021NTZF)

*8 An equivalent model with overseas brand compatibility is also available. (PC1S3052NTZF)

*9 An equivalent model with overseas brand compatibility is also available. (PC1S3063NTZF)



S2S3000F
(Mini-flat 4-pin)

PC2SD series
(PC3SD series, PC4SD series)
(6-pin DIP)

PC3SF series
(PC4SF series)
(6-pin DIP)

PC3ST11NSZAF
(PC3ST21NSZBF)
(4-pin DIP)

PC3SH11YFZAF
{ PC3SH21YFZBF,
PC3SH13YFZAF }
(4-pin DIP)

Notice





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■ Solid State Relay Lineup

Package	Applied voltage	Features	Model No.	Page
DIP 6-pin 	AC 100 V lines	General purpose	PR22MA11NTZF	86
	AC 200 V lines	General purpose	PR31MA11NTZF / PR32MA11NTZF	86
DIP 8-pin 	AC 100 V lines	General purpose	PR23MF11NSZF / PR26MF series / PR29MF series	86
		Built-in zero-cross circuit	PR26MF21NSZF / PR29MF21NSZF	86
	AC 200 V lines	General purpose	PR33MF51NSZF / PR36MF series / PR39MF series / PR3BMF11NSZF▲	86
		Built-in zero-cross circuit	PR36MF series / PR39MF series / PR3BMF21NSZF	86
SIP 4-pin  Sx0xT0xF series 	AC 100 V lines	General purpose	S102T01F / S108T01F / S101S05F / S102S01F / S112S01F / S116S01F	87
		Built-in zero-cross circuit	S102T02F / S108T02F / S101S06F / S102S02F / S116S02F	87
		Built-in snubber circuit	S102S11F	87
		Built-in zero-cross/snubber circuit	S101S16F / S102S12F	87
	AC 200 V lines	General purpose	S202T01F / S208T01F / S202S01F / S212S01F / S216S01F	87
		Built-in zero-cross circuit	S202T02F / S208T02F / S201S06F / S202S02F / S216S02F	87
		Built-in snubber circuit	S202S15F / S202S11F	87/88
		Built-in zero-cross/snubber circuit	S202S12F	88
		Reinforced isolation	S202SE1F▲ / S216SE1F▲	88
		Built-in zero-cross circuit	S202SE2F▲ / S216SE2F▲	88

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



Solid State Relays

<DIP type>

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*1			Package	Absolute maximum ratings			Electrical characteristics		
			UL	CSA	VDE*2		ON-state current I _T (rms) (A)	Repetitive peak OFF-state voltage V _{DRM} (V)	Isolation voltage (AC) V _{iso} (rms) (kV)	Min. trigger current I _{FT} (mA) MAX.	V _D (V)	R _L (Ω)
PR31MA11NTZF		200 V lines, compact	○	○	○	6-pin DIP	0.06	600	5.0	10	6	100
PR22MA11NTZF		100 V lines, 150 mA output in a small package	○	○	○							
PR32MA11NTZF		200 V lines, 150 mA output in a small package	○	○	○							
PR23MF11NSZF		100 V lines, compact	○	○	—	8-pin DIP	0.3	400	4.0	10	6	100
PR33MF51NSZF		200 V lines, compact	○	○	○							
PR26MF11NSZF		100 V lines, compact	○	○	—							
PR26MF12NSZF		100 V lines, compact, low input current	○	○	—							
PR29MF11NSZF		100 V lines, compact	○	○	—							
PR29MF12NSZF		100 V lines, compact, low input current	○	○	—							
PR26MF21NSZF		100 V lines, compact (built-in zero-cross circuit)	○	○	—							
PR29MF21NSZF		100 V lines, compact (built-in zero-cross circuit)	○	○	—							
PR36MF51NSZF		200 V lines, compact	○	○	○							
PR36MF12NSZF		200 V lines, compact, low input current	○	○	○							
PR39MF12NSZF	200 V lines, compact, low input current	○	○	○								
PR39MF51NSZF	200 V lines, compact	○	○	○								
PR3BMF11NSZF▲		200 V lines, compact, High-temperature operation (up to +105°C)	○	○	○		1.2	600	4.0	10	6	100
PR36MF22NSZF		200 V lines, compact (built-in zero-cross circuit), low input current	○	○	○	8-pin DIP	0.6	600	4.0	5	6	100
PR39MF22NSZF		200 V lines, compact (built-in zero-cross circuit), low input current	○	○	○							
PR36MF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○							
PR39MF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○							
PR3BMF21NSZF		200 V lines, compact (built-in zero-cross circuit)	○	○	○							

*1 Please refer to Specification Sheets for model numbers approved by safety standards.

*2 Optionally available.

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



PR22MA11NTZF
(6-pin DIP)

PR26MF21NSZF
(8-pin DIP)

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SOLID STATE RELAYS



<SIP type> (1)

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*6			Package	Absolute maximum ratings			Electrical characteristics					
			UL	CSA	TÜV EN 60950		ON-state current I _T (rms) (A)	Repetitive peak OFF-state voltage V _{DRM} (V)	Isolation voltage (AC) V _{iso} (rms) (kV)	I _{FT} (mA) MAX.	V _D (V)	R _L (Ω)			
S102T01F		100 V lines, low profile	○	○	-	Low profile 4-pin SIP	2	400	3.0	8	12	30			
S108T01F		100 V lines, low profile	-	-	-		8*2						8	12	30
S101S05F		100 V lines	○	○	-	4-pin SIP	3*3	400	3.0	15	12	30			
S102S01F		100 V lines	○	○	-		8*2						8	12	30
S112S01F		100 V lines	○	○	-		12*4		8	12	30				
S116S01F		100 V lines	○	○	-		16*5		8	12	30				
S102T02F		100 V lines, low profile (built-in zero-cross circuit)	○	○	-	Low profile 4-pin SIP	2	400	3.0	8	12	30			
S108T02F		100 V lines, low profile (built-in zero-cross circuit)	-	-	-		8*2						8	12	30
S101S06F		100 V lines (built-in zero-cross circuit)	○	○	-	4-pin SIP	3*3	400	3.0	15	6	30			
S102S02F		100 V lines (built-in zero-cross circuit)	○	○	-		8*2						8	6	30
S116S02F		100 V lines (built-in zero-cross circuit)	○	○	-		16*5	8	6	30					
S102S11F		100 V lines (built-in snubber circuit)	○	○	-	4-pin SIP	8*1	400	4.0	8	12	30			
S101S16F		100 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○	-	4-pin SIP	3*3	400	3.0	15	6	30			
S102S12F		100 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○	-		8*1						8	6	30
S202T01F		200 V lines, low profile	○	○	-	Low profile 4-pin SIP	2	600	3.0	8	12	30			
S208T01F		200 V lines, low profile	-	-	-		8*2						8	12	30
S202S01F		200 V lines	○	○	-	4-pin SIP	8*2	600	4.0	8	12	30			
S212S01F		200 V lines	-	-	-		12*4						8	12	30
S216S01F		200 V lines	-	-	-		16*5		8	12	30				
S202S15F		200 V lines, built-in snubber circuit	-	-	-	4-pin SIP	8*2	600	3.0	10	12	30			
S202T02F		200 V lines, low profile (built-in zero-cross circuit)	○	○	-	Low profile 4-pin SIP	2	600	3.0	8	12	30			
S208T02F		200 V lines, low profile (built-in zero-cross circuit)	-	-	-		8*2						8	12	30
S201S06F		200 V lines (built-in zero-cross circuit)	○	○	-	4-pin SIP	3*3		4.0	15	6	30			
S202S02F		200 V lines (built-in zero-cross circuit)	○	○	-		8*2						8	6	30
S216S02F		200 V lines (built-in zero-cross circuit)	-	-	-		16*5						8	6	30

*1 to *6: Please refer to the next page.

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<SIP type> (2)

○: Approved, △: Under application

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Approved by safety standards*6			Package	Absolute maximum ratings			Electrical characteristics		
			UL	CSA	TÜV EN 60950		ON-state current I _T (rms) (A)	Repetitive peak OFF-state voltage V _{DRM} (V)	Isolation voltage (AC) V _{iso} (rms) (kV)	I _{FT} (mA) MAX.	V _D (V)	R _L (Ω)
S202S11F		200 V lines (built-in snubber circuit)	○	○	—	4-pin SIP	8*1	600	4.0	8	12	30
S202S12F		200 V lines (built-in snubber circuit, built-in zero-cross circuit)	○	○	—		8*1	600	4.0	8	6	30
S202SE1F▲		200 V lines, reinforced isolation	○	○	○		8*2	600	3.0	8	12	30
S216SE1F▲			—	—	○		16*5			8	12	30
S202SE2F▲		200 V lines (built-in zero-cross circuit), reinforced isolation	○	○	○		8*2	600	3.0	8	6	30
S216SE2F▲			—	—	○		16*5			8	6	30

*1 T_c ≤ 88°C

*2 T_c ≤ 80°C

*3 T_c ≤ 100°C

*4 T_c ≤ 70°C

*5 T_c ≤ 60°C

*6 Please refer to Specification Sheets for model numbers approved by safety standards.

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



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■ Photointerrupter Lineup

<Transmissive type>

Output type	Package type	Outline	Mounting method	Model No. (series)	Page
Single phototransistor	Compact	High resolution	PWB mounting type/ Soldering reflow	GP1S296HCPSF/GP1S092HCPIF/ GP1S09xHCZ0F series/ GP1S19xHCZ0F/GP1S19xHCxSF	90
High response speed	Case type	General purpose	Snap-in	GP1S566VJ00F	91
		High resolution	PWB mounting type, etc.	GP1S5x series/GP1S5xVJ000F series/ GP1S56x series	91
		Horizontal slit, High resolution	PWB mounting type	GP1S59J0000F/GP1S525VJ00F	91
	With connector	General purpose	Snap-in	GP1S173LCS2F/GP1S74PJ000F	91
Darlington phototransistor	Case type	General purpose	PWB mounting type, etc.	GP1L5xJ series/GP1L5xV series	92
High sensitivity		Wide gap	PWB mounting type	GP1L57J0000F	92
Digital output	Compact	High voltage	PWB mounting type	GP1A98HCZ0F	92
(OPIC output)	Case type	High resolution	PWB mounting type	GP1A5x series	93
		Wide gap	Both-side/PWB mounting type	GP1A5xHR series/GP1A52LRJ00F	93
	With connector	General purpose	Screw mounting type/Snap-in	GP1A05 series/GP1A173LCS2F/ GP1A7x series/GP1A07x series	94

<Reflective type>

Output type	Package type	Outline	Mounting method	Model No. (series)	Page
Single phototransistor	Compact, DIP	General purpose	PWB mounting type	GP2S2x series	94
High response speed		Long focal distance	PWB mounting type	GP2S40J0000F	94
	Leadless	Long focal distance	PWB mounting type	GP2S700HCP	94
	Compact, thin (leadless)	General purpose	PWB mounting type	GP2S60	94
Darlington phototransistor	Compact, DIP	General purpose	PWB mounting type	GP2L24J0000F▲	95
High sensitivity			Screw mounting type/ Compact snap-in/ Inverter light countermeasures	GP2A2x series, GP2A200LCS0F/ GP2A231LRSAF, GP2A240LCS0F	95
OPIC output	With connector	Light modulation type, Sensitivity adjusted			

<Application-specific photointerrupter lineup>

Detection type	Outline (Output type etc.)	Mounting method	Model No. (series)	Page	
Transmissive type	With connector With actuator (Phototransistor output)	Snap-in	GP1S44S1J00F	96	
	With connector With actuator (OPIC output)	Snap-in	GP1A44E1J00F	96	
	Compact, (built-in ball)	(2-phase PT output) 3 direction detection	PWB mounting type	GP1S36J0000F▲	97
		(2-phase PT output) 4 direction detection	PWB mounting type	GP1S036HEZ▲	97
	Case type With encoder function	Resolution: Linear scale slit pitch: 0.17/0.14 mm	PWB mounting type	GP1A038RBK0F/GP1A046RBZLF/ GP1A047RBZLF/GP1A038RCK0F/ GP1A044RCKLF	97
	Phase A (digital output) Phase B (digital output)	Resolution: Linear scale slit pitch: 0.085 mm	PWB mounting type	GP1A047RDZLF	97
Reflective type	Injection For prism system (Single phototransistor)	Screw mounting	GP2S29SJ000F	98	
	For amusement use	–	GP2A221HRKA/GP2A222HCKA	98	

☆New product



■ Photointerrupters

<Transmissive type>

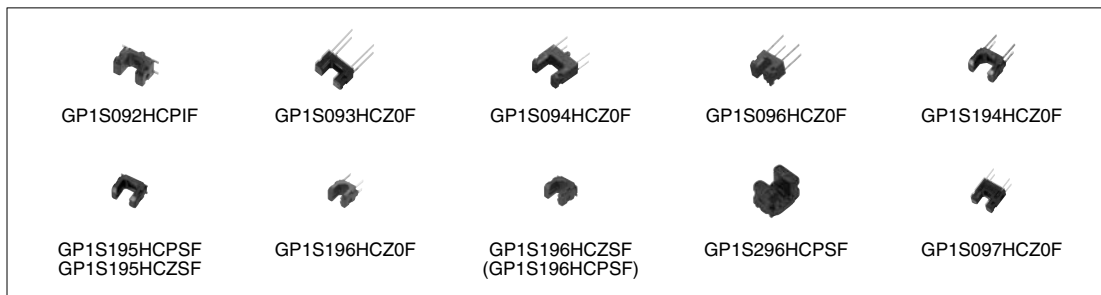
◆ Single phototransistor output

<Compact type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	IC (mA)	RL (Ω)	VCE (V)
GP1S092HCPIF		Height: 2.9 mm, For soldering reflow, with positioning boss	2.0	0.3	2.0	5	5	50	0.1	1 000	5
GP1S093HCZ0F		Low profile (2.9 mm), wide gap	2.0	0.3	2.0	5	5	50	0.1	1 000	5
GP1S094HCZ0F		Wide gap, with positioning pin, PWB mounting type (5.5 × 2.6 × 4.8 mm)	3.0	0.3	0.8	5	5	50	0.1	1 000	5
GP1S096HCZ0F		Low profile (3.5 × 2.6 × 2.9 mm)	1.0	0.3	2.0	5	5	50	0.1	1 000	5
GP1S194HCZ0F		Compact, wide gap, size: 3.7 × 2.0 × 2.7 mm	1.7	0.3	1.0	5	5	–	–	–	–
GP1S195HCZSF GP1S195HCPSF		Compact, wide gap, surface mount compatible, size: 3.5 × 2.0 × 2.7 mm	1.5	0.3	1.0	5	5	–	–	–	–
GP1S196HCZ0F		Compact, Low profile (3.1 × 2.0 × 2.7 mm)	1.1	0.3	2.0	5	5	50	0.1	1 000	5
GP1S196HCZSF GP1S196HCPSF		Surface mount, for soldering reflow, compact, low profile (3.1 × 2.0 × 2.7 mm)	1.1	0.3	2.0	5	5	50	0.1	1 000	5
☆GP1S296HCPSF		Compact, Low profile (2.5 × 1.8 × 1.9 mm)	1.0	0.2	3.0	5	5	50	0.1	1 000	5
GP1S097HCZ0F		High resolution, wide gap, with mounting hole (4.5 × 2.6 × 4.5 mm)	2.0	0.3	2.0	5	5	50	0.1	1 000	5

* Topr: -25 to +85 °C



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☆New product



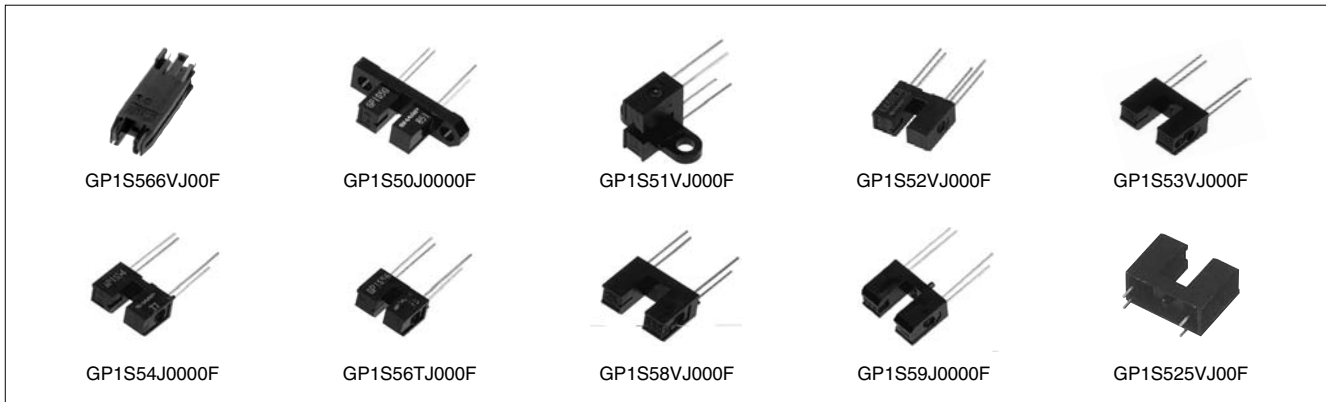
<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	IC (mA)	RL (Ω)	VCE (V)
GP1S566VJ00F		Long case, snap-in mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S50J0000F		High resolution, both-side mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S51VJ000F*1		High resolution, side mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S52VJ000F*1		High resolution, PWB mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S53VJ000F		High resolution, PWB mounting type	5.0	0.5	2.5	20	5	3	2	100	2
GP1S54J0000F		High resolution, with positioning pin, PWB mounting type	3.0	0.5	2.5	20	5	3	2	100	2
GP1S56TJ000F		High resolution, with positioning pin, PWB mounting type	2.0	0.15	2.0	20	5	38	0.5	1 000	2
GP1S58VJ000F		High resolution, with positioning pin, PWB mounting type	5.0	0.5	2.5	20	5	3	2	100	2
GP1S59J0000F		High resolution, horizontal slit, with positioning pin, PWB mounting type	4.2	0.5	2.5	20	5	3	2	100	2
GP1S525VJ00F		Short lead type with easy board mounting, horizontal slit, high precision positioning (lead: within ø1.2 mm)	5.0	0.5	3.25	20	10	3	2	100	2

* Topr: -25 to +85 °C

*1 High reliability types: GP1SQ51VJ00F and GP1SQ52J000F are also available.

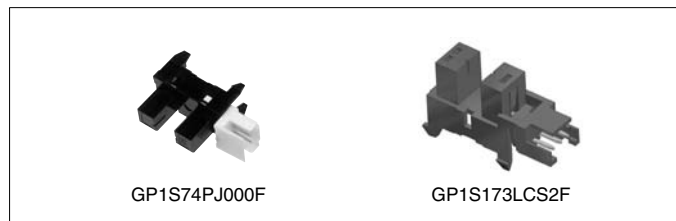


<With connector>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	IC (mA)	RL (Ω)	VCE (V)
GP1S74PJ000F		Snap-in mounting type with connector Applicable to 3 kinds of thickness of mounting boards	5.0	0.5	2.5	20	5	3	2	100	2
☆GP1S173LCS2F		Snap-in mounting integrated connector type Applicable to 3 kinds of thickness of mounting boards	5.0	0.5	2.5	20	5	3	2	100	2

* Topr: -25 to +85 °C, -30 to +95 °C (GP1S173LCS2F)



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◆Darlington phototransistor output

<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics						
					Current transfer ratio			Response time			
					CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	IC (mA)	RL (Ω)	VCE (V)
GP1L50J000F		High resolution, both-side mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L51J000F		High resolution, side mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L52VJ000F		High resolution, PWB mounting type	3.0	0.5	50	1	2	80	2	100	2
GP1L53VJ000F		High resolution, PWB mounting type	5.0	0.5	30	1	2	80	2	100	2
GP1L57J0000F		Wide gap, PWB mounting type	10.0	1.8	70	1	2	130	2	100	2

* Topr: -25 to +85 °C



◆OPIC type ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<Compact type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics							
					Threshold input current			Propagation delay time				
					IFLH (mA) MAX.	IFHL (mA) MAX.	VCC (V)	tPLH (μs) TYP.	tPHL (μs) TYP.	IF (mA)	RL (Ω)	VCC (V)
GP1A98HCZ0F		Compact, PWB mounting	3.0	0.5	8	-	3.3 to 24	10.0	2.0	10	3 900 to 20 000	3.3 to 24

* Topr = -25 to +85°C



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<Case type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics							
					Threshold input current			Propagation delay time				
					IFLH (mA) MAX.	IFHL (mA) MAX.	VCC (V)	tPLH (μs) TYP.	tPHL (μs) TYP.	IF (mA)	RL (Ω)	VCC (V)
GP1A50HRJ00F		Both-side mounting type	3.0	0.5	5	–	5	3	5	5	280	5
GP1A51HRJ00F		Side mounting type	3.0	0.5	5	–	5	3	5	5	280	5
GP1A52HRJ00F		PWB mounting type	3.0	0.5	5	–	5	3	5	5	280	5
GP1A53HRJ00F		PWB mounting type	5.0	0.5	8	–	5	3	5	8	280	5
GP1A57HRJ00F		PWB mounting type, with positioning pin	10.0	1.8	7	–	5	3	5	7	280	5
GP1A58HRJ00F		PWB mounting type, with positioning pin	5.0	0.5	8	–	5	3	5	8	280	5
GP1A52LRJ00F		PWB mounting type	3.0	0.5	–	5	5	5	3	5	280	5

* Topr = –25 to +85°C



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☆New product



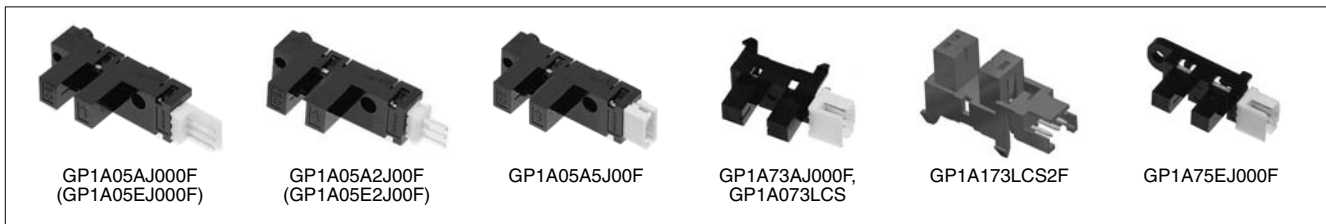
◆OPIC type ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

<With 3-pin connector terminal>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Detecting and emitting gap (mm)	Slit width (mm)	Electro-optical characteristics					
					Supply voltage V _{CC} (V)		V _{OL} (V) MAX.	Low level output voltage		
					MIN.	MAX.		Light cut-off	I _{OL} (mA)	V _{CC} (V)
GP1A05AJ000F		Either-side mounting type	5.0	0.5	4.5	5.5	0.35	No	16	5
GP1A05A2J00F		Either-side mounting type	5.0	0.5	4.5	5.5	0.35	No	16	5
GP1A05A5J00F		Either-side mounting type	5.0	0.5	4.5	5.5	0.35	No	16	5
☆GP1A173LCS2F		Snap-in mounting integrated connector type	5.0	0.5	4.5	5.5	0.35	No	4	5
GP1A73AJ000F		Compact, snap-in mounting type	5.0	0.5	4.5	5.5	0.35	No	4	5
GP1A073LCS		Compact, snap-in mounting type, low voltage operation	5.0	0.5	2.7	5.5	0.35	No	4	5
GP1A75EJ000F		Either-side mounting type	5.0	0.5	4.5	5.5	0.35	Yes	16	5
GP1A05EJ000F		Either-side mounting type	5.0	0.5	4.5	5.5	0.4	Yes	16	5
GP1A05E2J00F		Screw mounting type	5.0	0.5	4.5	5.5	0.4	Yes	16	5

* Topr: -20 to +75°C, -30 to +95 °C (GP1A173LCS2F)



Photointerrupters

<Reflective type>

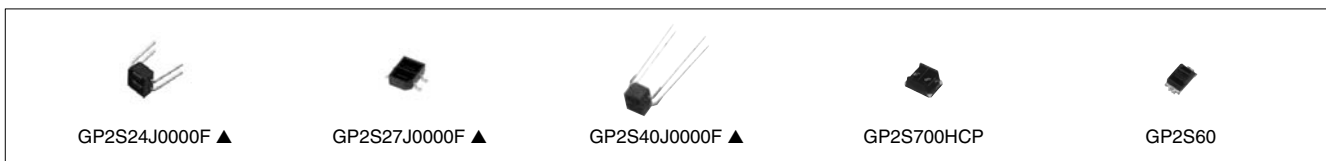
◆Single phototransistor output

<Compact>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Focal distance (mm)	Electro-optical characteristics							
				Current transfer ratio			Response time				
				CTR (%) MIN.	I _F (mA)	V _{CE} (V)	tr (μs) TYP.	I _C (mA)	R _L (Ω)	V _{CE} (V)	
GP2S24J0000F▲		Compact (DIP), visible light cut-off	0.7	0.5	4	2	20	0.1	1 000	2	
GP2S27J0000F▲		Compact, allow reflow soldering, visible light cut-off	0.7	0.5	4	2	20	0.1	1 000	2	
GP2S40J0000F▲		Compact, long focal distance, visible light cut-off	3	2.5	20	5	50	0.1	1 000	2	
GP2S700HCP		Compact, long focal distance, surface mounting leadless type	3	1.5	4	2	20	0.1	1 000	2	
GP2S60		Thin (3.2 × 1.7 × t: 1.1 mm), leadless type	(0.5)	1.75"1 TYP.	4	2	20	0.1	1 000	2	

* Topr: -25 to +85°C *1 Detection area: 1 mm
The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



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◆Darlington phototransistor output <Compact>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Focal distance (mm)	Electro-optical characteristics						
				Current transfer ratio			Response time			
				CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	Ic (mA)	RL (Ω)	VCE (V)
GP2L24J0000F▲		Compact (DIP), visible light cut-off	0.7	12.5	4	2	80	10	100	2

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



◆OPIC output ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.) <With 3-pin connector terminal>

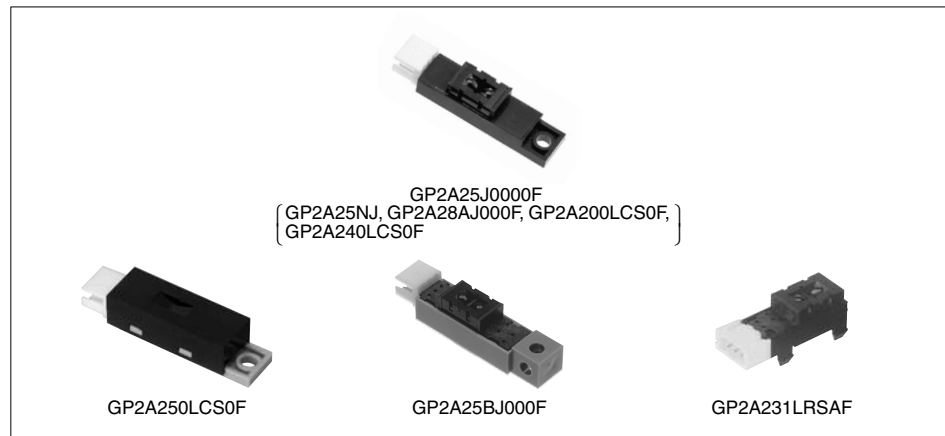
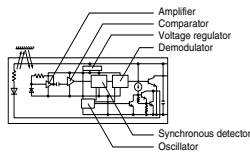
(Ta = 25°C)

Model No.	Internal connection diagram	Features	Optimum detecting distance (mm)	Electro-optical characteristics					
				Supply voltage Vcc (V)		Dissipation current Icc (mA)		Low level output voltage VoL (V)	
				MIN.	MAX.	Vcc (V)	MAX.	MAX.	Vcc (V)
GP2A200LCS0F	(Following diagram)	Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	5 to 15	4.75	5.25	30*1	5	0.4	5
GP2A240LCS0F		Improved light-resistance characteristic for inverter lighting (500 lx), light modulation type, connector output	5 to 15	4.75	5.25	30*1	5	0.4	5
GP2A250LCS0F		Static electricity resistant, improved light-resistance characteristic for inverter lighting (500 lx), light modulation type, connector output	5 to 15	4.75	5.25	30*1	5	0.4	5
GP2A25J0000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	3 to 7	4.75	5.25	30*1	5	0.4	5
GP2A231LRS0F		Compact, hook type, multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	3 to 7	4.75	5.25	20*1	5	0.4	5
GP2A25NJJ00F		Multi types of paper detectable, light modulation type, sensitivity adjusted, applicable to inverter fluorescent lamp, built-in visible light cut filter	3 to 6	4.75	5.25	30*1	5	0.4	5
GP2A25BJ000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted	3 to 7	4.75	5.25	30*1	5	0.4	5
GP2A28AJ000F		Multi types of paper detectable, light modulation type, with connector, sensitivity adjusted, detecting portion with flat configuration	3 to 7	4.75	5.25	30*1	5	0.4	5

* Top: -10 to +60°C (GP2A25J0000F, GP2A25BJ000F)

*1 Smoothing value RL = ∞

[Internal connection diagram]



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Photointerrupters for Specific Applications

◆ Transmissive type

<Single phototransistor output type with actuator and 3-pin connector terminal>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Actuator lever starting torque (Initial) MAX.	Electro-mechanical characteristics*1									
				Light beam interrupted					Light beam uninterrupted				
				Dissipation current		Collector current			Dissipation current		Collector current		
				Icc1 (mA)	Vcc (V)	Ic1 (μA)	Vcc (V)	Vo (V)	Icc2 (mA)	Vcc (V)	Ic2 (mA)	Vcc (V)	Vo (V)
GP1S44S1J00F		Spring lever type actuator United with connector	1 × 10 ⁻⁴ N•m or less	20 MAX.	5	50 MAX.	5	5	20 MAX.	5	0.25 MIN.	5	5

* Topr: -25 to +75 °C

*1 Operating voltage: 4.5 to 5.5 V



<OPIC type with actuator and 3-pin connector terminal>

(“OPIC” (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Absolute maximum ratings		Electro-mechanical characteristics	Electro-mechanical characteristics*1										
			Supply voltage Vcc (V)	Output current IoL (mA)		Actuator lever starting torque	Light beam interrupted					Light beam uninterrupted				
							Dissipation current		Low level output voltage			Dissipation current		High level output voltage		
							IcCL (mA)	Vcc (V)	VoL (V)	Vcc (V)	IoL (mA)	IcCH (mA)	Vcc (V)	VoH (V)	Vcc (V)	RL (kΩ)
GP1A44E1J00F		Spring lever type actuator, united with connector	10	50	1 × 10 ⁻⁴ N•m or less	20 MAX.	5	0.4 MAX.	5	16	20 MAX.	5	Vcc × 0.9 MIN.	5	47	

* Topr: -25 to +75 °C

*1 Operating voltage: 4.5 to 5.5 V



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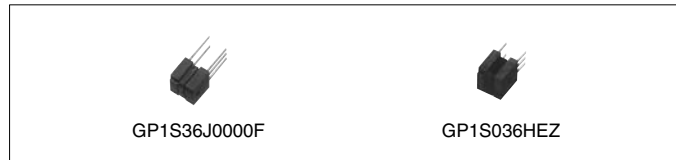
<Compact, 2-phase phototransistor output type>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Electro-optical characteristics						
			Current transfer ratio			Response time			
			CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	IC (mA)	RL (Ω)	VCE (V)
GP1S36J0000F▲		Built-in ball (2 phase output), compact, PWB mounting type	1.2	5	5	50	0.1	1 000	5
GP1S036HEZ▲		Built-in ball (2 phase output), compact, PWB mounting type, 4-direction detection	1.1	5	5	50	0.1	1 000	5

* Topr: -25 to +85 °C

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



<Case type, with encoder function>

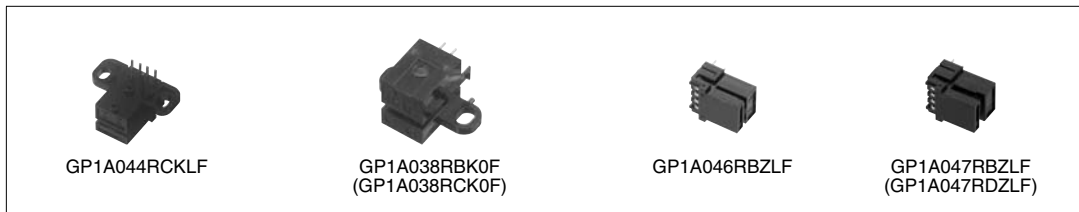
(Ta = 25°C)

Model No.	Absolute maximum ratings		Electro-optical characteristics					
	Vcc (V)	Topr (°C)	Operating voltage Vcc (V)	Output signal	Resolution	Response frequency (kHz) MAX.	IF (mA)	Dissipation current (output side) Icc (mA) MAX.
GP1A038RBK0F*1, *2	7	0 to +70	2.7 to 5.5	Phase A (Digital output) Phase B (Digital output)	Linear scale slit pitch 0.17 (mm)	20	11	5
GP1A038RCK0F*1, *2	7	0 to +70	2.7 to 5.5		Linear scale slit pitch 0.14 (mm)	20	11	5
GP1A044RCKLF*1	—	-10 to +60	2.7 to 5.5		Linear scale slit pitch 0.14 (mm)	20	15	5
GP1A046RBZLF*1	—	-10 to +60	2.7 to 5.5		Linear scale slit pitch 0.17 (mm)	20	20	5
GP1A047RBZLF*1, *3	—	-10 to +60	2.7 to 5.5		Linear scale slit pitch 0.17 (mm)	20	20	7
GP1A047RDZLF*1, *3	—	-10 to +60	2.7 to 5.5		Linear scale slit pitch 0.0847 (mm)	120	20	7

*1 High precision read and low affection of angle error from vibration thanks to the multi-segment PD system

*2 Duty ratio: 50±20%, phase difference: 90±45°

*3 Duty ratio: 50±15%, phase difference: 90±45°



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◆ Reflective type

<Case type, phototransistor output>

(Ta = 25°C)

Model No.	Internal connection diagram	Features	Focal distance (mm)	Electro-optical characteristics							
				Current transfer ratio			Response time				
				CTR (%) MIN.	IF (mA)	VCE (V)	tr (μs) TYP.	Ic (mA)	RL (Ω)	VCE (V)	
GP2S29SJ000F		Long focal distance (with prism system), compact, screw mounting type	*1	1.0*1	20	5	38	0.5	1 000	2	

* Topr: -25 to +85°C

*1 Space between prism and sensor is 8 mm.



<For amusement use>

(Ta = 25°C)

Model No.	Features	Electro-optical characteristics		
		Supply voltage Vcc	Dissipation current Icc (mA)	Response frequency f (Hz)
GP2A221HRKA	Employs reflective type, pinball detector, connector with lock	4.5 to 15	MAX. 10	MAX. 500
GP2A222HCKA	Employs reflective type, pinball detector, connector with lock In conjunction with an IC, detects beam interruption*1	4.5 to 16.5	MAX. 10	MAX. 500

*1 Used together with interface IC for control (IR3N184)



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■ Phototransistor Lineup

Package	Output type	Features	Half sensitivity angle	Model No.	
				Standard	Visible light cut-off
Epoxy resin with lens (ø3 mm)	Single phototransistor	General purpose	±20°	PT380	PT380F
	Darlington phototransistor	High sensitivity	±20°	PT381	PT381F
Epoxy resin with lens	Single phototransistor	General purpose/Narrow acceptance	±13°	PT480E0000F	PT480FE0000F
		Compact, thin	±35°	PT4800E0000F	PT4800FE000F / PT4850FE000F
	Darlington phototransistor	High sensitivity/Narrow acceptance	±13°	PT481E0000F	PT481FE0000F
		High sensitivity/Narrow acceptance/Long lead	±13°	—	PT483F1E000F
		High sensitivity/Compact, thin	±35°	PT4810E0000F	PT4810FJE00F
		High sensitivity/Intermediate acceptance	±40°	—	PT491FE0000F
		High sensitivity/Intermediate acceptance/Long lead	±40°	—	PT493FE0000F
TO-18	Single phototransistor	Narrow acceptance	±6°	PT501 ▲	—
		Narrow acceptance/With base terminal	±6°	PT510 ▲	—
	Darlington phototransistor	Narrow acceptance/With base terminal	±6°	PT550 ▲	—
		Wide acceptance/With base terminal	±50°	PT550F ▲	—
Surface mounting leadless type	Single phototransistor	Compact	±60°	PT600T	—
		Compact (surface mounting type)	±70°	PT200MC0NP	—
		Compact (infrared cut type)	±60°	PT202MR0MP1	—
	Darlington phototransistor	Compact (side view/top view mounting possible)	±15°	PT100MC0MP	PT100MF0MP
		Compact	±60°	PT601T	—
		Compact (side view/top view mounting possible)	±15°	—	PT100MF1MP
		Compact (side view/top view mounting possible)	±15°	—	PT100MF1MP

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



Phototransistors

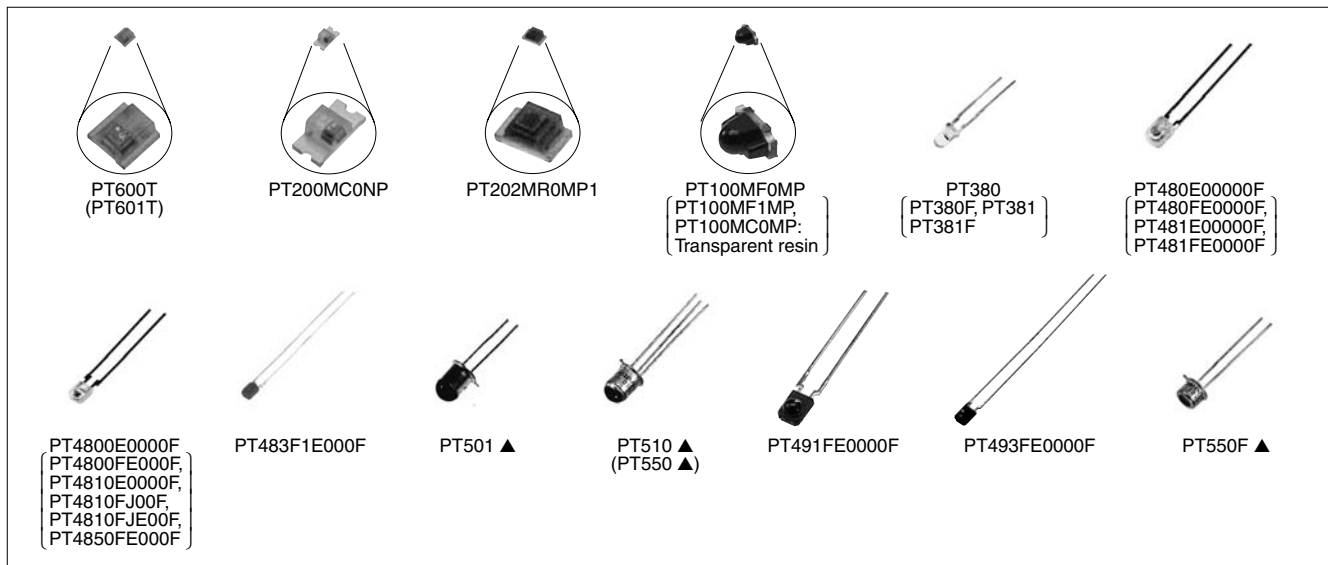
Type	Model No.	Package	Absolute maximum ratings			Ic (mA)				ICEO(A)		$\Delta\theta$ (°) TYP.	λ_p (nm) TYP.
			V _{CEO} (V)	P _c (mW)	T _{opr} (°C)	MIN.	MAX.	V _{CE} (V)	E _e (mW/cm ²)	MAX.	V _{CE} (V)		
Single	PT380	ø3 epoxy resin	35	50	-25 to +85	0.16	1.17	5	Ev, 100 lx	1 × 10 ⁻⁷	20	±20	800
	PT380F*1		35	50	-25 to +85	0.095	0.9	5	Ev, 100 lx	1 × 10 ⁻⁷	20	±20	860
	PT600T	Surface mounting leadless type	35	50	-25 to +85	0.7	TYP. 3.5	5	5	1 × 10 ⁻⁷	20	±60	880
	PT200MC0NP		50	50	-25 to +85	0.016	0.059	5	0.1	1 × 10 ⁻⁷	20	±70	930
	PT202MR0MP1*2		5	5	-30 to +85	—	TYP. 0.043	1.5	Ev, 100 lx	1 × 10 ⁻⁷	1.5	±60	620
	PT100MC0MP		35	75	-30 to +85	1.7	5.1	5	1	1 × 10 ⁻⁷	20	±15	900
	PT100MF0MP*1		35	75	-30 to +85	1.15	3.45	5	1	1 × 10 ⁻⁷	20	±15	910
	PT480E0000F		35	75	-25 to +85	0.4	TYP. 1.7	5	1	1 × 10 ⁻⁷	20	±13	800
	Epoxy resin with lens	PT480FE0000F*1	35	75	-25 to +85	0.25	TYP. 0.8	5	1	1 × 10 ⁻⁷	20	±13	860
		PT4800E0000F	35	75	-25 to +85	0.12	TYP. 0.4	5	1	1 × 10 ⁻⁷	20	±35	800
		PT4800FE0000F*1	35	75	-25 to +85	0.08	TYP. 0.25	5	1	1 × 10 ⁻⁷	20	±35	860
		PT4850FE0000F*1	35	75	-25 to +85	0.12	0.56	5	1	1 × 10 ⁻⁷	20	±35	860
TO-18	PT501 ▲	45	75	-25 to +125	2.5	TYP. 10	5	10	1 × 10 ⁻⁷	30	±6	800	
	PT510 ▲	35	75	-25 to +125	2.5	TYP. 20.0	5	10	1 × 10 ⁻⁷	30	±6	800	
Darlington	PT381	ø3 epoxy resin	35	50	-25 to +85	0.12	1.5	10	Ev, 2 lx	1 × 10 ⁻⁶	10	±20	800
	PT381F*1		35	50	-25 to +85	0.07	1.08	10	Ev, 2 lx	1 × 10 ⁻⁶	10	±20	860
	PT481E0000F	Epoxy resin with lens	35	75	-25 to +85	1.5	25	2	0.1	1 × 10 ⁻⁶	10	±13	800
	PT481FE0000F*1		35	75	-25 to +85	0.9	27	2	0.1	1 × 10 ⁻⁶	10	±13	860
	PT4810E0000F		35	75	-25 to +85	0.45	7.0	2	0.1	1 × 10 ⁻⁶	10	±35	800
	PT4810FJE000F*1		35	75	-25 to +85	0.27	6.0	2	0.1	1 × 10 ⁻⁶	10	±35	860
	PT483F1E000F*1		35	75	-25 to +85	1.5	4.0	2	0.1	1 × 10 ⁻⁶	10	±13	860
	PT491FE0000F*1		35	75	-25 to +85	0.2	0.8	2	Ev, 2 lx	1 × 10 ⁻⁶	10	±40	860
	TO-18	PT493FE0000F*1	35	75	-25 to +85	0.2	0.8	2	Ev, 2 lx	1 × 10 ⁻⁶	10	±40	860
		PT550 ▲	35	150	-25 to +125	3	TYP. 20.0	5	0.1	1 × 10 ⁻⁶	10	±6	800
	PT550F ▲	35	150	-25 to +125	3	TYP. 20.0	5	1.0	1 × 10 ⁻⁶	10	±50	800	
	Leadless chip type	PT601T	35	50	-25 to +85	0.03	0.3	10	0.01	1 × 10 ⁻⁶	10	±60	880
Surface mounting leadless type	PT100MF1MP*1	35	75	-30 to +85	0.2	1.2	5	0.01	1 × 10 ⁻⁶	10	±15	860	

*1 Visible light cut-off type

*2 Infrared cut-off type

Note) Some products are handled by the Compound Semiconductor Division.

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



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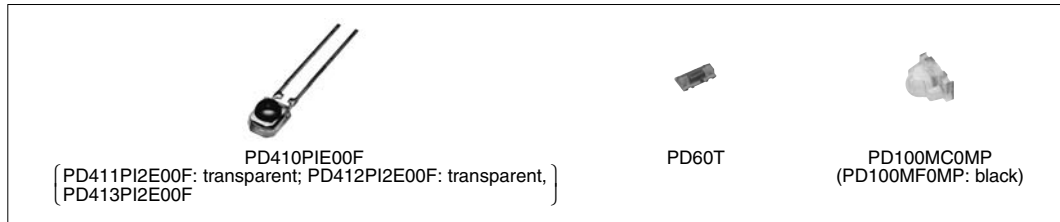
■ PIN Photodiodes

(Ta = 25°C)

Model No.	Features	Package (Material)	Active area (mm ²)	Topr (°C)	Isc (μA) MIN.	Ev (lx)	Id (A) MAX.	VR (V)	tr, tf (μs) TYP.	VR (V)	RL (kΩ)	λp (nm) TYP.
PD410PI2E00F*1	PIN type	Visible light cut-off epoxy resin with condenser (lens)	3.31	-25 to +85	2.5	100	1 × 10 ⁻⁸	10	0.2	10	1	1 000
PD411PI2E00F		Epoxy resin with transparent condenser (lens)	3.31	-25 to +85	5.0	100	1 × 10 ⁻⁸	10	0.2	10	1	960
PD412PI2E00F*2		Epoxy resin with transparent condenser (lens)	3.31	-25 to +85	3.5	100	1 × 10 ⁻⁸	10	0.25	10	1	800
PD413PI2E00F*1	PIN type IrDA1.0	Visible light cut-off epoxy resin with condenser (lens)	3.31	-25 to +85	MIN. 4.5 (TYP. 5.4)	100	1 × 10 ⁻⁸	10	0.2	10	1	960
PD60T	Chip device type	Transparent resin	-	-25 to +85	TYP. 4	1 000	1 × 10 ⁻⁸	10	0.1	10	1	960
PD100MCOMP	Surface mounting leadless type	Transparent epoxy resin board with lens	-	-30 to +85	0.6	100	1 × 10 ⁻⁸	10	0.01	15	0.18	820
PD100MFOMP*1	Surface mounting leadless type	Visible light cut-off epoxy resin board with lens	-	-30 to +85	0.4	100	1 × 10 ⁻⁸	10	0.01	15	0.18	850

*1 Visible light cut-off type

*2 Tape packaging type (PD412TNE00F)



■ Blue Sensitive Photodiodes

(Ta = 25°C)

Model No.	Features	Package (Material)	Active area (mm ²)	Topr (°C)	Isc (μA) MIN.	Ev (lx)	Id (A) MAX.	VR (V)	λp (nm) TYP.
BS520E0F	Planer type	Resin (black)	5.34	-20 to +60	0.4	100	1 × 10 ⁻¹¹	1	560



■ Laser Power Monitoring Photodiodes for Optical Disc System

(Ta = 25°C)

Model No.	Features	Package (Material)	Active area (mm)	Topr (°C)	Isc (mA) TYP.	Ev (lx)	Id (A) MAX.	VR (V)	λp (nm) TYP.
PD101SC0SS1F	High response speed (cut-off frequency: 400 MHz)	Transparent epoxy resin	ø0.8	-25 to +85	450	100	1 × 10 ⁻⁹	5	820



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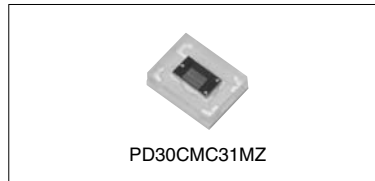
☆New product



■ RGB Color Sensor

(Ta = 25°C)

Model No.	Features	Package	Peak sensitivity wavelength (nm)			Light receiving sensitivity (A/W) TYP.			Topr (°C)
			Blue	Green	Red	Blue	Green	Red	
☆PD30CMC31MZ	RGB 3-color LED compatible 3PD structure Filter-on chip structure allows for both infrared light reducing characteristics and a more compact size (1.1 mm thick)	Surface mounting 3 x 4 mm	460	540	620	0.18	0.23	0.16	-40 to +85



■ OPIC Light Detectors ("OPIC" (Optical IC) is a trademark of SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.)

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings				Electro-optical characteristics							
			Vcc (V)	P (mW)	Io (mA)	Topr (°C)	EV _{LH} (lx) MAX.	EV _{HL} (lx) MAX.	Vcc (V)	t _{PLH} (μs) TYP.	t _{PHL} (μs) TYP.	Vcc (V)	Ev (lx)	RL (Ω)
IS485E	Built-in schmidt trigger circuit, amplifier and voltage regulator	Transparent epoxy resin with condenser (lens)	-0.5 to +17	175	50	-25 to +85	-	35	5	5	3	5	50	280
IS486E			-0.5 to +17	175	50	-25 to +85	35	-	5	3	5	5	50	280



<Low-voltage operation>

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings				Electro-optical characteristics							
			P (mW)	Io (mA)	Topr (°C)	Operating supply voltage (V)	EV _{LH} (lx) MAX.	EV _{HL} (lx) MAX.	Vcc (V)	t _{PHL} (μs) TYP.	t _{PLH} (μs) TYP.	Vcc (V)	Ev (lx)	RL (Ω)
IS489E	Built-in Schmidt trigger circuit and amplifier	Transparent epoxy resin with condenser (lens)	80	2	-25 to +85	1.4 to 7.0	-	15	3	1.3	8.5	3	125	3 000



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OPIC LIGHT DETECTORS



<Model employing a light modulating system>

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings				Electro-optical characteristics*2						External disturbing light illuminance EvDx(Ix) TYP.
			Vcc (V)	P (mW)	Io (mA)	ToPr (°C)	VOL (V) MAX.	VOH (V) MIN.	tPLH (μs) TYP.	tPHL (μs) TYP.	VCC (V)	RL (Ω)	
IS471FE*1, *3	Built-in pulse driver circuit at the emitter side, synchronous detector circuit, amplifier circuit and demodulator circuit	Visible light cut-off epoxy resin	-0.5 to +16	250	50	-25 to +60	0.35	4.97	400	400	5	280	7 000

*1 IS471FE is less susceptible to disturbing effects thanks to the light modulation system

*2 Vcc = 5 V

*3 Straight lead type (IS471FSE) is also available.



<For laser beam printers (laser origin detection)>

(Ta = 25°C)

Model No.	Type	Package	Electro-optical characteristics			
			Recommended supply voltage Vcc (V)	VOH (V) MIN.	VOL (V) MAX.	H → L delay time variation ΔtPHL (ns) MAX.
GA220T2L1IZ	2PD, differential type	Transparent epoxy resin 18-pin	4.5 to 5.5	4.9	0.6	±8.5



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☆New product



<Ambient light sensors>

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings			Electro-optical characteristics					
			Vcc (V)	Io (mA)	ToPr (°C)	Recommended supply voltage Vcc (V)	Recommended illuminance range Ex (lx)	Dissipation current Icc (μA) TYP.	Peak sensitivity wavelength λp (nm)	Io1 (μA) TYP.	Io2 (μA) TYP.
GA1A2S100SS	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance Lead frame (straight) type	Transparent epoxy resin (3 × 4 mm)	7.0	5	-40 to +85	2.7 to 3.6	10 to 10 000	500	555	480 (at Ev = 1000 lx)	48 (at Ev = 100 lx)
GA1A2S100LY	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance Lead frame (L bend) type		7.0	5	-40 to +85	2.7 to 3.6	10 to 10 000	500	555	480 (at Ev = 1000 lx)	48 (at Ev = 100 lx)
GA1A1S201WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Logarithmic current output for illuminance	Compact (2.0 mm × 1.6 mm)	7.0	1	-40 to +85	2.3 to 3.2	3 to 55 000	70	555	20 (at Ev = 100 lx)	30 (at Ev = 1000 lx)
☆GA1A1S100WP	Built-in amplification circuit Peak sensitivity characteristic close to human visual sensitivity Output characteristic: Linear current output for illuminance	Leadless	7.0	10	-40 to +85	2.7 to 3.6	10 to 5 000	1 460	555	1420 (at Ev = 1000 lx)	142 (at Ev = 100 lx)



GA1A2S100SS

GA1A2S100LY

GA1A1S201WP
(GA1A1S100WP)

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OPIC LIGHT DETECTORS

☆New product



<Optical disk devices for RF signal detection>

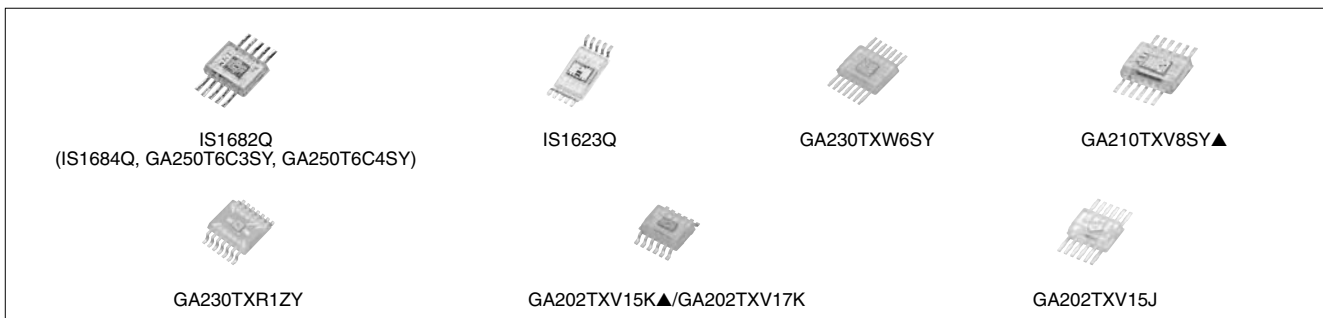
(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings			Electro-optical characteristics					
			Vcc (V)	P (mW)	Topt (°C)	Icc (mA) TYP.	Vcc (V)	Response frequency fc*1 (MHz) TYP.	Vcc (V)	Output noise level Vn Main Ch. (dBm) TYP.	f (Hz)
IS1682Q	Built-in amplifier circuit, built-in RF addition amplifier (6-division PINPD + IC), for ×50 CD-ROM	Transparent 10-pin package	6.0	–	–30 to +80	14.8	5	(72/70) 72/70	5	–81	23.1M
GA250T6C3SY	Built-in amplifier circuit (6-division PINPD + IC), for CD player, low operating voltage (MIN. 2.5 V)	Transparent 10-pin package	7.0	–	–20 to +75	6	5	5/0.3	5	(–78)	2.8M
GA250T6C4SY											
IS1623Q	Built-in amplifier circuit (8-division PINPD + IC), switchable of sensitivity due to playback/recording mode, for MD player	Transparent flat 10-pin package	6.0	150	–20 to +70	4.2/ 4.6*2	3	5.3/3.8*2	3	–90	720k
IS1684Q	Built-in RF amplifier, for ×6 DVD-ROM drive	Transparent flat 10-pin package	6.0	–	–30 to +80	14.8	5	(70/60) 70/50	5	–81	23.1M
GA210TXV8SY▲*3	For 2-wavelength laser (For DVD player), 10-division PD pattern	Transparent flat 12-pin package (4 x 5.0 mm)	6.0	–	–10 to +70	17	5	–75	5	–80	23M
GA230TXW6SY	For ×16 DVD-R/RW, +R/W ultra-writable drive High-precision 3-step gain compatible	Transparent flat 14-pin package (4 x 5.0 mm)	6.0	–	–30 to +85	–	5	140	5	–	–
GA230TXR1ZY	DVD-ROM: for MAX. ×16 read only CD-ROM: for MAX. ×52 read only CD-R: for MAX. ×52 writable drive CD-RW: for MAX. ×32 writable drive	Transparent flat 14-pin package	6.0	–	–20 to +85	40	5	140	5	–80	72M
GA202TXV15K▲	For 2-wavelength laser (For DVD player), 10-division PD pattern	Transparent 12-pin package (3 x 4 mm)	6.0	–	–30 to +80	MAX. 19	5	57/57 50/50	5	–	–
GA202TXV15J		Gull wing lead Flat lead									
GA202TXV17K ☆GA202TXV17M	For 2-wavelength laser (For DVD player), 10-division PD pattern (GA202TXV17M: Moisture-proof package)	Transparent 12-pin package (3 x 4 mm)	6.0	–	–30 to +80	MAX. 19	5	–	–	–	–

*1 (RF/main) ... 650 nm, RF/main ... 780 nm

*2 Playback/recording mode

*3 We can supply custom orders for modified PD patterns, packages, and lead shapes for 2-wavelength laser compatible OPIC light detectors. The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



Optoelectronics

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<Laser power monitoring diode for optical disc system>*1

(Ta = 25°C)

Model No.	Type	Package	Absolute maximum ratings			Electro-optical characteristics			
			Vcc (V)	P (mW)	Topr (°C)	Icc (mA) TYP.	Vcc (V)	fc (MHz) MIN.	Vcc (V)
GA104T1M1MZ▲	For x48 CD-R writable drive, built-in amplifier circuit	Leadless chip-type (3.0 x 3.5 mm)	6.0	—	−20 to +70	20	5	50	5

*1 Power monitoring photodiodes are also available. Please refer to the page for photodiodes. The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



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■ Infrared Emitting Diode Lineup

Type	Package	Features	Half intensity angle	Model No.
Single-end lead (Top view type)	Epoxy resin with lens ($\phi 3$ mm type)	General purpose	$\pm 13^\circ$	GL380
		High output type	$\pm 13^\circ$	GL381
		High speed signal transmission (12 MHz)	$\pm 17^\circ$	GL382
	Epoxy resin (Arch type)	General purpose	$\pm 18^\circ$	GL390 ▲
		Low forward voltage type	$\pm 18^\circ$	GL390V ▲
Single-end lead (Side view type)	Epoxy resin with lens	General purpose/Narrow beam angle	$\pm 13^\circ$	GL480E0000F
		Compact and thin	$\pm 30^\circ$	GL4800E0000F
	Flat epoxy resin	Wide beam angle	$\pm 90^\circ$	GL4100E0000F
	Epoxy resin with lens	Compact package, bi-directional emitting type	Bidirectional	GL453E00000F ▲
Single-end lead (Top view type)	TO-18	High reliability	$\pm 50^\circ$	GL513F ▲
		High reliability/Narrow beam angle	$\pm 7^\circ$	GL514 ▲
	Epoxy resin with lens ($\phi 5$ mm type)	Low forward voltage type	$\pm 21^\circ$	GL560
		Low forward voltage type/Narrow beam angle	$\pm 13^\circ$	GL561
		High output type	$\pm 25^\circ$	GL537
		High output type/Narrow beam angle	$\pm 13^\circ$	GL538
Surface mount type	Leadless	Compact	$\pm 60^\circ$	GL610T
	Epoxy resin with lens/ leadless (Mountable for Top view/ Side view type)	Compact/Narrow beam angle	$\pm 10^\circ$	GL100MN0MP
		High output type (Output: radiant flux/ radiant intensity indicated)	$\pm 10^\circ/\pm 9^\circ$	GL100MN1MP / GL100MN3MP
		Compact/Wide beam angle	$\pm 80^\circ$	GL100MD1MP1

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



■ Infrared Emitting Diodes

(Ta = 25°C)

Model No.	Package, features	Absolute maximum ratings				Φe (mW)			VF (V)			Δθ (°) TYP.	λp (nm) TYP.
		IF (mA)	VR (V)	P (mW)	Topr (°C)	MIN.	TYP.	IF (mA)	TYP.	MAX.	IF (mA)		
GL380	ø3 epoxy resin	60	6	150	-25 to +85	4.5*1	11*1	50	1.3	1.5	50	±13	950
GL381		60	6	150	-25 to +85	8.5*1	20*1	50	1.3	1.5	50	±13	950
GL382	ø3 epoxy resin, for high speed signal transmission:12 MHz	60	4	-	-25 to +85	6	18	50	1.5	1.7	50	±17	880
GL390 ▲	Arch type	60	6	150	-25 to +85	7*1	13*1	50	1.3	1.5	50	±18	950
GL390V ▲		60	6	150	-25 to +85	9*1	16*1	50	1.3	1.5	50	±18	950
GL453E00000F ▲	Epoxy resin with bidirectional lens	50	6	75	-25 to +85	0.85	1.3	20	1.2	1.5	20	(Bidirectional)	950
GL480E00000F	Epoxy resin with lens	50	6	75	-25 to +85	0.7	-	20	1.2	1.4	20	±13	950
GL480E00000F		50	6	75	-25 to +85	0.7	1.6	20	1.2	1.4	20	±30	950
GL4100E0000F	Side-view flat type, epoxy resin	50	6	75	-25 to +85	1.0	-	20	1.2	1.4	20	±90	950
GL513F ▲	TO-18	150	6	250	-40 to +125	1.44	2.88	100	1.35	1.6	100	±50	950
GL514 ▲		150	6	250	-40 to +125	3.31	5.35	100	1.35	1.6	100	±7	950
GL560	ø5 epoxy resin	100	6	150	-25 to +85	5*1	14*1	50	1.25	1.37	50	±21	940
GL561		100	6	150	-25 to +85	12*1	25*1	50	1.25	1.37	50	±13	940
GL537		100	6	150	-25 to +85	6*1	13*1	50	1.3	1.5	50	±25	950
GL538		100	6	150	-25 to +85	15*1	30*1	50	1.3	1.5	50	±13	950
GL610T	Leadless chip type	50	6	150	-25 to +85	0.7	2	20	1.3	1.5	50	±60	950
GL100MN0MP	Surface mounting leadless type, epoxy resin board with lens	50	6	75	-30 to +85	1.0	3.0 (MAX.)	20	1.2	1.4	20	±10	940
GL100MN1MP	Surface mounting leadless type, epoxy resin board with lens, high output type	50	6	75	-30 to +85	2.0	6.0 (MAX.)	20	1.2	1.5	20	±10	940
GL100MN3MP	Surface mounting leadless type, epoxy resin board with lens, high output type	50	6	75	-30 to +85	3.0*1	6.0*1	20	1.25	1.5	20	±9	940
GL100MD1MP1	Surface mounting leadless type, epoxy resin board with lens, wide beam angle	50	6	75	-30 to +85	-	6.0 (MAX.)	20	-	1.5	20	±80	940

*1 Radiant intensity mW/sr

Note) Some products are handled by the Compound Semiconductor Division.

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Distance Measuring Sensor Lineup

Output	Range of distance measuring	Features	Model No.
1-bit digital output according to distance measuring	3 to 30 cm	1-bit digital output (detected distance: 15/13 cm)	GP2D150AJ00F/GP2Y0D413K0F
	10 to 80 cm	1-bit digital output (detected distance: 24 cm)	GP2D15J0000F
		General purpose	GP2Y0D21YK0F
	20 to 150 cm	1-bit digital output (detected distance: 80 cm)	GP2Y0D02YK0F
		Battery drive compatible, compact, operating supply voltage (2.7 V to 6.2 V), 1-bit digital output (detected distance: 5/10 cm)	GP2Y0D805Z0F/GP2Y0D810Z0F
		Compact, thin 1-bit digital output (detected distance: 10/40 cm)	GP2Y0D310K/GP2Y0D340K
Output according to distance measuring		Compact, operating supply voltage (2.7 V to 6.2 V), 1-bit digital output (detected distance: 1.5 cm) Capable of operation at high temperature	GP2Y5D91S00F
	4 to 30 cm	Analog voltage output	GP2D120XJ00F/GP2Y0A41SK0F
	10 to 80 cm	Analog voltage output	GP2D12J0000F
		General purpose	GP2Y0A21YK0F
	20 to 150 cm	Analog voltage output	GP2Y0A02YK0F
100 to 550 cm	Analog voltage output	GP2Y0A710K0F	

Wide Angle Sensor Lineup

Output	Range of distance measuring	Detection angle of view	Model No.
Voltage output according to distance measuring	4 to 30 cm	25° (When using 5 beams)	GP2Y3A001K0F
	20 to 150 cm	25° (When using 5 beams)	GP2Y3A002K0F
	40 to 300 cm	25° (When using 5 beams)	GP2Y3A003K0F

High-Precision Displacement Sensor

Output	Range of distance measuring	Features	Model No.
Voltage output according to distance measuring	4.5 to 6.0 mm	Resolution: 50 μm	GP2Y0AH01K0F

Paper Size Sensor (Using Optical Distance Measuring Method) Lineup

Output	Features	Model No.
8-bit serial output	1-beam	GP2D06J0000F/GP2D061J000F/ GP2D062J000F
	Thin type (T: 11 mm)	GP2Y2E101K0F
		GP2D03J0000F/GP2D032J0000F
	2-beam	GP2D07J0000F/GP2D071J000F
	3-beam	Thin type (T: 11 mm) GP2Y2E301K0F
1-bit output	1-beam (detection height: 60 mm) Thin type (T: 11.5 mm)	GP2Y2D160K0F
Analog output relative to measuring distance	1-beam (detection height: 80 mm) Thin type (T: 11.5 mm)	GP2Y2A180K0F
	2-beam (detection height: 80 mm) Thin type (T: 11.5 mm)	GP2Y2A280K0F

Dust Sensor Unit Lineup

Output	Features	Model No.
Analog output	Pulse analog output, single-shot detection of house dust, general purpose	GP2Y1010AU0F

Color Toner Concentration (Deposition Amount) Sensor Lineup

Output	Features	Model No.
Analog output	Employs diffuse reflection system	GP2TC1J0000F
	Employs diffuse reflection system + mirror reflection system	GP2Y40010K0F

Distance Measuring Sensors (1)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics*1					
		Vcc (V)	Topr (°C)	Distance measuring range (cm)	VOH (V) MIN.	VOL (V) MAX.	Dissipation current		Measured distance (cm)
						Operating (mA)	Standby (µA)		
GP2D12J0000F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, linear voltage output	-0.3 to +7	-10 to +60	10 to 80	Vo (TYP.) = 0.4 V (at L = 80 cm), ΔVo (TYP.) = 2.0 V (at L: 80 cm → 10 cm)		MAX. 50	-	-
GP2Y0A21YK0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, linear voltage output	-0.3 to +7	-10 to +60	10 to 80	Vo (TYP.) = 0.4 V (at L = 80 cm), ΔVo (TYP.) = 1.9 V (at L: 80 cm → 10 cm)		MAX. 40	-	-
GP2D120XJ00F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, linear voltage output	-0.3 to +7	-10 to +60	4 to 30	Vo (TYP.) = 0.4 V (at L = 30 cm), ΔVo (TYP.) = 2.25 V (at L = 30 cm → 4 cm)		MAX. 50	-	-
GP2Y0D805Z0F	Light detector, infrared LED and signal processing circuit, short distance measuring sensor unit, battery drive compatible (operating power supply: 2.7 to 6.2 V)	-0.3 to +7	-10 to +60	-	Vcc -0.6	0.6	MAX. 6.5	MAX. 8	5
GP2Y0D810Z0F	Light detector, infrared LED and signal processing circuit, short distance measuring sensor unit, battery drive compatible (operating power supply: 2.7 to 6.2 V)	-0.3 to +7	-10 to +60	-	Vcc -0.6	0.6	MAX. 6.5	MAX. 8	10
☆GP2Y5D91S00F	Light detector, infrared LED and signal processing circuit, short distance measuring sensor unit, battery drive compatible (operating power supply: 2.7 to 6.2 V), capable of operation at high temperature	-0.3 to +7	-30 to +105	-	Vcc -0.6	0.6	TYP. 7	-	1.5
GP2Y0D310K	Digital voltage output according to the measured distance of GP2Y0D340K	-0.3 to +7	-10 to +60	-	Vcc -0.3	0.6	MAX. 35	-	10
GP2Y0D340K	Compact, thin type (15 x 9.6 x 8.7 mm: sensor part), Light detector, infrared LED and signal processing circuit, digital voltage output according to the measured distance	-0.3 to +7	-10 to +60	-	Vcc -0.3	0.6	MAX. 35	-	40
GP2D15J0000F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, digital voltage output	-0.3 to +7	-10 to +60	10 to 80	Vcc -0.3	0.6	MAX. 50	-	24
GP2Y0D21YK0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, digital voltage output	-0.3 to +7	-10 to +60	10 to 80	Vcc -0.3	0.6	MAX. 40	-	24
GP2Y0A41SK0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, short measuring cycle (16.5 ms)	-0.3 to +7	-10 to +60	4 to 30	Vo (TYP.) = 0.4 V (at L = 30 cm), ΔVo (TYP.) = 2.25 V (at L = 30 cm → 4 cm)		MAX. 22	-	-
GP2D150AJ00F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, digital voltage output	-0.3 to +7	-10 to +60	3 to 30	Vcc -0.3	0.6	MAX. 50	-	15
GP2Y0D413K0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, digital voltage output	-0.3 to +7	-10 to +60	3 to 30	Vcc -0.3	0.6	-	-	13
GP2Y0D02YK0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit, long distance measuring sensor unit (No external control signal required), digital voltage output according to the measured distance	-0.3 to +7	-10 to +60	20 to 150	Vcc -0.3	0.6	MAX. 50	-	80

*1 Vcc = 5 V

* PSD: Position Sensitive Detector

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☆New product



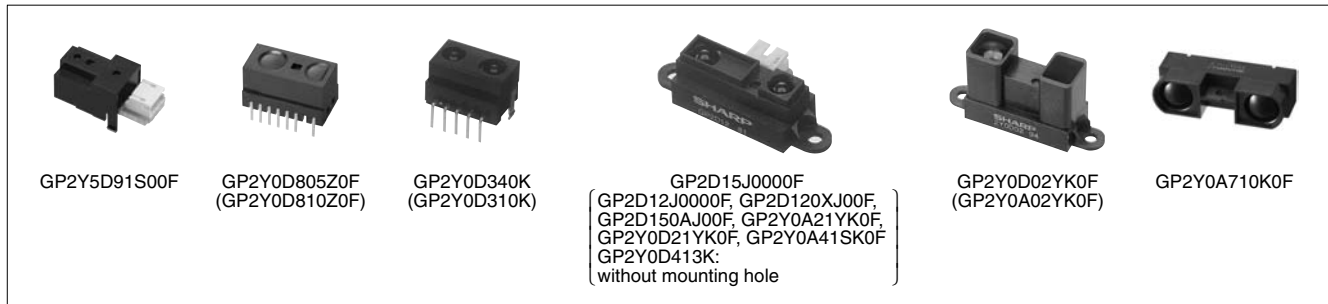
Distance Measuring Sensors (2)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics*1					
		Vcc (V)	Topr (°C)	Distance measuring range (cm)	VoH (V) MIN.	VoL (V) MAX.	Dissipation current		Measured distance (cm)
							Operating (mA)	Standby (µA)	
GP2Y0A02YK0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit	-0.3 to +7	-10 to +60	20 to 150	Vo (TYP.) = 0.4 V (at L = 150 cm), ΔVo (TYP.) = 2.0 V (at L = 150 cm → 20 cm)		MAX. 50	-	-
☆GP2Y0A710K0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit	-0.3 to +7	-10 to +60	100 to 550	Vo (TYP.) = 2.5 V (at L = 100 cm), ΔVo (TYP.) = 0.7 V (at L = 100 cm → 200 cm)		TYP. 30	-	-

*1 Vcc = 5 V

* PSD: Position Sensitive Detector



Wide Angle Sensors

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electro-optical characteristics					
		Vcc (V)	Topr (°C)	Distance measuring range (cm)	Output terminal voltage (V)	Output voltage difference (V)	Input voltage (V)		
							VINH	LEDL	
GP2Y3A001K0F	Distance measuring sensor united with PSD*, infrared LED and signal processing circuit,	-0.3 to +7	-10 to +60	4 to 30	TYP. 2.8*1	TYP. 1.6*4	MIN. 4.5	MAX. 0.5	
GP2Y3A002K0F	distance measuring sensor application product,	-0.3 to +7	-10 to +60	20 to 150	TYP. 2.3*2	TYP. 1.6*5	MIN. 4.5	MAX. 0.5	
GP2Y3A003K0F	wide range (field of view) detection using 5 infrared beams	-0.3 to +7	-10 to +60	40 to 300	TYP. 2.2*3	TYP. 1.2*6	MIN. 4.5	MAX. 0.5	

* PSD: Position Sensitive Detector

Reflector used: White paper (Gray chart R-27/white surface, made by Kodak Corp., reflectance 90%)

*1 L = 4 cm

*4 Change in output voltage from L = 4 cm to 10 cm

*2 L = 20 cm

*5 Change in output voltage from L = 20 cm to 80 cm

*3 L = 40 cm

*6 Change in output voltage from L = 40 cm to 100 cm

L = Reflector - Sensor distance



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■ Paper Size Sensors

(Ta = 25°C)

Model No.	Features	Operating temperature	Supply voltage	Paper detection height	LED beam pitch	Approved value of paper position sliding	Paper detection density	Dissipation current
		Topr (°C)	Vcc (V)	H (mm)	Lp (mm)	Δx (mm)	OD	Icc (mA)
GP2D03J0000F GP2D032J0000F*4	8-bit serial output using optical distance measuring method (2-beam)	0 to +60	5 ±0.5	TYP. 60	TYP. 21	MAX. ±6	0.7 or less*1	TYP. 30
GP2D06J0000F GP2D061J0000F*2 GP2D062J0000F*2	8-bit serial output using optical distance measuring method (1-beam)	0 to +60	5 ±0.5	TYP. 60	–	MAX. ±6	0.7 or less*1	TYP. 33
GP2Y2E101K0F	Thin type (T: 11 mm), 8-bit serial output using optical distance measuring method (1-beam)	0 to +60	5 ±0.5	TYP. 85	–	MAX. ±6	0.7 or less*1	–
GP2Y2D160K0F	Thin type (T: 11.5 mm), using optical distance measuring method (1-beam), digital output (1-bit)	–10 to +60	5 ±0.5	TYP. 60	–	MIN. ±7.5	0.7 or less*1	–
GP2D07J0000F GP2D071J0000F*3	8-bit serial output using optical distance measuring method (3-beam)	0 to +60	5 ±0.5	TYP. 60	TYP. 36	MAX. ±6	0.7 or less*1	TYP. 33
GP2Y2E301K0F	Thin type (T: 11 mm), 8-bit serial output using optical distance measuring method (3-beam)	0 to +60	5 ±0.5	TYP. 85	TYP. 33	MAX. ±6	0.7 or less*1	–
GP2Y2A180K0F	Thin type (T: 11.5 mm), analog output using optical distance measuring method (1-beam)	–10 to +60	5 ±0.5	TYP. 80	–	–	–	MAX. 25
GP2Y2A280K0F	Thin type (T: 11.5 mm), analog output using optical distance measuring method (2-beam)	–10 to +60	5 ±0.5	TYP. 80	–	–	–	MAX. 50

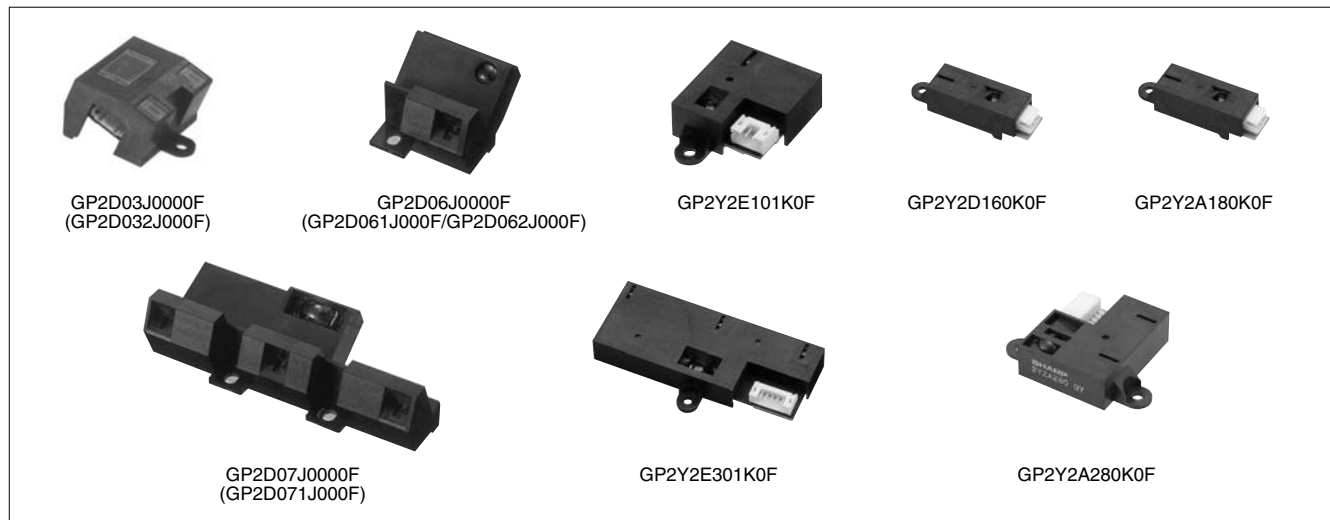
* This table shows the characteristics when configured in the paper size sensor system.

*1 Reflectivity: 18% or more, OD = log (1/T), T: Reflectivity

*2 Paper detection height GP2D061: TYP. 45 mm GP2D062: TYP. 90 mm

*3 Paper detection height GP2D071: TYP. 45 mm

*4 Paper detection height GP2D032: TYP. 45 mm



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High-Precision Displacement Sensor

(Ta = 25°C)

Model No.	Features	Topr (°C)	Operating supply voltage (V)	Dissipation current (mA)	Distance measuring range (mm)	Distance characteristic of output
GP2Y0AH01K0F	Resolution: 50 μm	-10 to +60	4.5 to 5.5	TYP. 20	4.5 to 6.0	TYP. 1.73 V Variation in output over range (4.5 to 6.0 mm)



Dust Sensor Units

(Ta = 25°C)

Model No.	Features	Topr (°C)	Electro-optical characteristics				
			Operating supply voltage (V)	Dissipation current (mA)	Detection sensitivity V/(0.1 mg/m ³)	Output voltage at no dust Voc (V)	Output voltage range V _{OH} (V)
GP2Y1010AU0F	Built-in infrared emitting diode, photodiode and signal processing circuit, compact, single-shot detection of house dust	-10 to +65	4.5 to 5.5	TYP. 11	TYP. 0.5	TYP. 0.9	MIN. 3.4



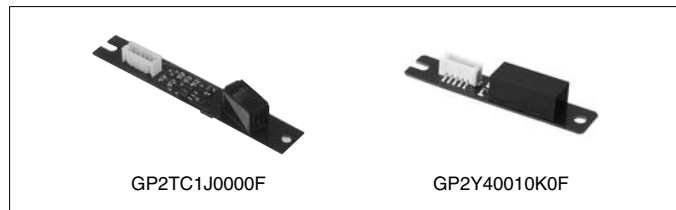
Color Toner Concentration (Deposition Amount) Sensors

(Ta = 25°C)

Model No.	Features	Topr (°C)	Electro-optical characteristics		
			Dissipation current (mA)	Output voltage V ₀₁ (V)	Output voltage V ₀₂ (V)
GP2TC1J0000F	Employs diffuse reflection system, high-precision detection of toner concentration on photo-sensitive drum, 2-line analog output	0 to +60	TYP. 4* ¹	TYP. 1.06* ²	TYP. 2.63* ²
GP2Y40010K0F	Employs diffuse reflection system + mirror reflection system, high-precision detection of toner concentration on transfer belt, 2-line analog output	0 to +60	MAX. 10	MAX. 1.61	MAX. 3.5

*1 Dissipation current with LED drive current of I_F = 0 mA

*2 With reflection object A (Reflectance: 15.6%)



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■ Fiber Optics Lineup for Audio Equipment

Connector type	Type	Features	Model No.				
			Supply voltage 2.5 V	Supply voltage 3.0 V	Supply voltage 5.0 V		
Square connector (EIAJ RC-5720B)	Fiber optic transmitter	Compact (without mounting hole)	High speed signal transmission (13.2 Mb/s MAX., 15.5 Mb/s MAX.*, 50 Mb/s MAX.**), With shutter	–	GP1FMV31TK0F*	GP1FMV51TK0F GP1FM55HTZ0F**	
		with mounting hole	High speed signal transmission (13.2 Mb/s MAX. [15.5 Mb/s MAX.*, 50 Mb/s MAX.**])	–	GP1FAV30TK0F*	–	
			With shutter	–	GP1FAV31TK0F*	–	
		Fiber optic receiver	Compact (without mounting hole)	High speed signal transmission (13.2 Mb/s MAX., 15.5 Mb/s MAX.*), With shutter	–	GP1FMV31RK0F*	GP1FMV51RK0F
					–	GP1FAV30RK0F*	GP1FAV50RK0F
	–				GP1FAV31RK0F*	GP1FAV51RK0F	
	Square connector (EIAJ RC-5720B)	Fiber optic transmitter	Thin type (t: 4.2 mm)	Low operating voltage	GP1FD210TP0F	GP1FD310TP0F/ GP1FD320TP0F	–
			with mounting hole	High speed signal transmission (13.2 Mb/s MAX. [15.5 Mb/s MAX.*, 25 Mb/s MAX.**])	–	GP1FAV30RK0F*	GP1FAV50RK0F
				With shutter	–	GP1FAV31RK0F*	GP1FAV51RK0F
			Fiber optic receiver	Thin type (t: 4.2 mm)	Low operating voltage	–	GP1FD210RP0F
–						–	–
–		–				–	

■ Transmission/Reception Devices for MOST*1 Compatible Optical Fiber

Connector type	Type	Features	Transmission speed	Operating voltage	Model No.
MOST ver1.1 standard compatible	Optical transmission device	Wide operating temperature range (–40°C to +105°C)	25Mb/s as optic fiber link (Biphase)	5 V	GP5FM5T01AZ
				3.3 V	GP5FM3T01AZ/ GP5FM3T01BZ (Long-lead type)
	Optical reception device	Wide operating temperature range (–40°C to +105°C)	25Mb/s as optic fiber link (Biphase)	5 V	GP5FM5R01AZ
				3.3 V	GP5FM3R01AZ/ GP5FM3R01BZ (Long-lead type)

*1 "MOST" is a registered trademark of MOST Cooperation.



■ Fiber Optic Transmitters (Square Connector)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electro-optical characteristics					
		Vcc (V)	Vin (V)	Topr (°C)	Supply voltage (V)	Propagation delay time		Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
						tPLH (ns) MAX.	tPHL (ns) MAX.			
GP1FMV31TK0F	Compact (without mounting hole), with shutter, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FMV51TK0F	Compact (without mounting hole), with shutter, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FM55HTZ0F	Compact (without mounting hole), with shutter, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	50
GP1FAV30TK0F	With mounting hole, low voltage drive, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FAV50TK0F	With mounting hole, mass-market model, high response speed (up to x2), TTL drive compatible	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25 Input voltage: MIN. 2.0 V	180	180	13	±15	13.2
GP1FAV51TK0F	With mounting hole, mass-market model, high response speed, with shutter, TTL drive compatible	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FSV51TK0F	Vertical mounting, with shutter, low voltage drive, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	13.2
GP1FAV31TK0F	With mounting hole, with shutter, low voltage drive, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.7 to 5.25	180	180	12	±15	15.5
GP1FSV31TK0F	Vertical mounting, with shutter, low voltage drive, high response speed	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.7 to 5.25	180	180	13	±15	15.5
GP1FAV55TK0F	With mounting hole, high response speed (50 Mb/s), with shutter	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	50
GP1FP513TK0F	Electric jack/optical connector integrated type	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	4.75 to 5.25	180	180	13	±15	13.2

■ Fiber Optic Transmitters (ø3.5 mm Optical Mini-jack)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electro-optical characteristics					
		Vcc (V)	Vin (V)	Topr (°C)	Supply voltage (V)	Propagation delay time		Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
						tPLH (ns) MAX.	tPHL (ns) MAX.			
GP1FD210TP0F	Compact, Thin type (t: 4.2 mm), Optical mini-jack (low voltage type)	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.2 to 3.0	180	180	10	±30	8
GP1FD310TP0F	Compact, Thin type (t: 4.2 mm), Optical mini-jack (low voltage type)	-0.5 to +7	-0.5 to Vcc + 0.5	-20 to +70	2.7 to 3.6	180	180	12	±30	8
GP1FD320TP0F	Compact, Thin type (t: 4.2 mm), Optical mini-jack (low voltage type)	-	-	-20 to +70	2.3 to 5.5	-	-	12	-	25

The model marked with may not be available in the near future. Contact with SHARP for details before use.

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■ Fiber Optic Receivers (Square Connector)

(Ta = 25°C)

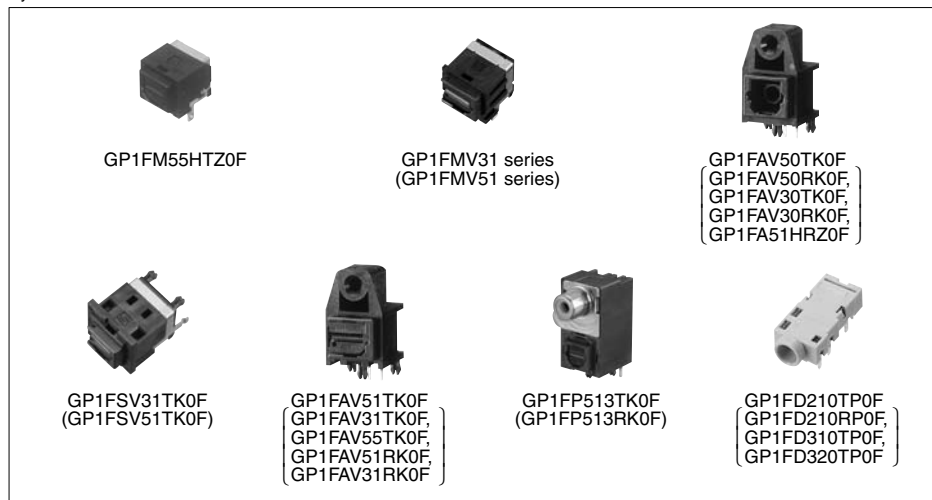
Model No.	Features	Absolute maximum ratings			Electro-optical characteristics					
		Vcc (V)	IOL (mA)	Topr (°C)	Supply voltage (V)	Propagation delay time		Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
						tPLH (ns) MAX.	tPHL (ns) MAX.			
GP1FMV31RK0F	Compact (without mounting hole), With shutter, High response speed (up to x2)	-0.5 to +7	10	-20 to +70	2.7 to 3.6	180	180	15	±20	15.5
GP1FMV51RK0F	Compact (without mounting hole), With shutter, High response speed (up to x2)	-0.5 to +7	10	-20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV30RK0F	With mounting hole, Low voltage drive, High response speed	-0.5 to +7	10	-20 to +70	2.7 to 3.6	180	180	15	±20	15.5
GP1FAV50RK0F	With mounting hole, Mass-market model, High response speed (up to x2)	-0.5 to +7	10	-20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV51RK0F	High response speed (up to x2), with shutter	-0.5 to +7	10	-20 to +70	4.75 to 5.25	180	180	25	±20	13.2
GP1FAV31RK0F	With mounting hole, With shutter, Low voltage drive, High response speed (up to x2)	-	-	-20 to +70	2.7 to 3.6	-	-	15	-	15.5
GP1FA51HRZ0F	With mounting hole, High response speed (up to x4), with shutter	-	-	-20 to +70	4.75 to 5.25	-	-	15	-	25
GP1FP513RK0F	Electric jack/optical connector integrated type	-0.5 to +7	10	-20 to +70	4.75 to 5.25	180	180	25	±20	13.2

■ Fiber Optic Receiver (ø3.5 mm Optical Mini-jack)

(Ta = 25°C)

Model No.	Jack	Features	Absolute maximum ratings			Electro-optical characteristics					
			Vcc (V)	IOL (mA)	Topr (°C)	Supply voltage (V)	Propagation delay time		Dissipation current Icc (mA) MAX.	Pulse width distortion Δtw (ns)	Transmission speed T (Mb/s) MAX.
							tPLH (ns) MAX.	tPHL (ns) MAX.			
GP1FD210RP0F	ø3.5	Thin (thickness: 4.2 mm), optical mini-jack (low voltage drive)	-0.5 to +7	4	-20 to +70	2.4 to 3.0	180	180	7.5	±30	8

The model marked with may not be available in the near future. Contact with SHARP for details before use.

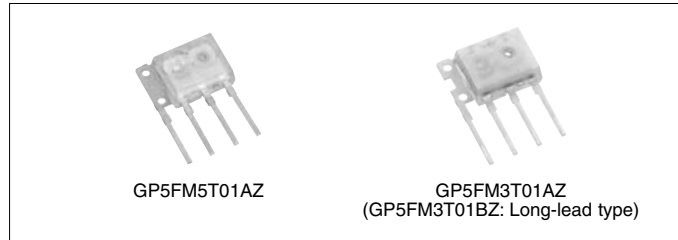


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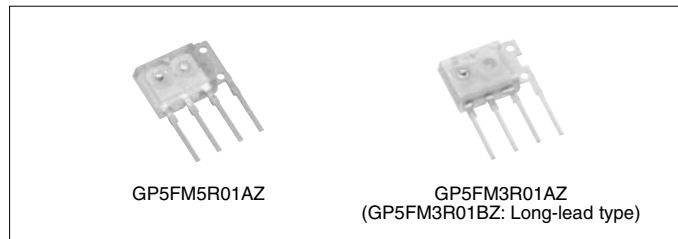
■ Optical Transmission Device

Model No.	Features	Operating temperature (°C)	Optic output (dBm)	Dissipation current		Operating voltage (V)	Transmission speed T (Mb/s)
				Operating (mA)	Standby (μA)		
GP5FM5T01AZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range 	-40 to +105	-9 to -1.5	MAX. 20	MAX. 2.5	4.75 to 5.25	25 (Biphase)
★GP5FM3T01AZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range 	-40 to +105	-7.5 to -2	MAX. 20	MAX. 2.5	3.3±5%	25 (Biphase)
★GP5FM3T01BZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range • Long-lead type 	-40 to +105	-7.5 to -2	MAX. 20	MAX. 2.5	3.3±5%	25 (Biphase)



■ Optical Reception Device

Model No.	Features	Operating temperature (°C)	Optic output (dBm)	Dissipation current		Operating voltage (V)	Transmission speed T (Mb/s)
				Operating (mA)	Standby (μA)		
GP5FM5R01AZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range 	-40 to +105	-24 to -2	MAX. 20	MAX. 5	4.75 to 5.25	25 (Biphase)
★GP5FM3R01AZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range 	-40 to +105	-25.5 to -2	MAX. 20	MAX. 5	3.3±5%	25 (Biphase)
★GP5FM3R01BZ	<ul style="list-style-type: none"> • MOST standard compatible • Wide operating temperature range • Long-lead type 	-40 to +105	-25.5 to -2	MAX. 20	MAX. 5	3.3±5%	25 (Biphase)



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High-Luminosity (AlGaInP) LED Series

(Ta = 25°C)

Radiation color	Green	Yellow-green	Amber	Sunset orange	Orange	Red	
Series	ZG, JG	ZE, JE	ZV, JV, YV	ZS, JS, YS	ZJ, JJ, YJ	ZR, JR	JU
Dominant emission wavelength (nm)	(560)	(572)	(588)	(605)	(618)	(630)	(638)
Radiation material	AlGaInP on GaAs						

High-Luminosity (InGaN) LED Series

(Ta = 25°C)

Radiation color	Blue	Green
Series	BC	GC
Dominant emission wavelength (nm)	(470)	(525)
Radiation material	InGaN	

White Type LED Series

(Ta = 25°C)

Radiation color	White
Series	BW
Color range (x, y)	(0.31, 0.31)
Radiation material	InGaN + Fluorescent powder

Pastel Color LED Series

(Ta = 25°C)

Radiation color	Light blue	Lemon yellow	Purple
Series	CA	CY	CV
Color range (x, y)	(0.17, 0.20)	(0.42, 0.48)	(0.35, 0.15)
Radiation material	InGaN + Fluorescent powder		

LED Series

(Ta = 25°C)

Radiation color	Green	Yellow-green	Yellow-green (High-luminosity)	Yellow	Sunset orange	Red	Red	Red (High-luminosity)	Red (High-luminosity)	Red
Series	KG, K	EG, E, C*	FG, F	HY, H	HS, S	HD, D	HA, A	TR, T	UR, U	PR, P
Peak emission wavelength (nm)	555	565	565	585	610	635	650	660	660	695
Radiation material	GaP	GaP	GaP	GaAsP on GaP	GaAsP on GaP	GaAsP on GaP	GaAsP on GaP	GaAlAs on GaAs Single hetero	GaAlAs on GaAlAs Double hetero	GaP

* C is the opposite polarity of EG's.

High-Luminosity (AlGaInP) LED Lamps

(If = 20 mA, Ta = 25°C)

Appearance	Radiation shape (mm)	Resin type		High-luminosity													
				JG, ZG (Green)		JE, ZE (Yellow-green)		JV, ZV (Amber)		JS, ZS (Sunset orange)		ZJ, JJ (Orange)		ZR, JR, JU (Red)			
				Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.		
Cylinder	ø3	Colored diffusion	•														
		Colored transparency	•	GL3JG402B0SE	85	GL3JE402B0SE	200	GL3ZV402B0SE	400	GL3ZS402B0SE	400	GL3ZJ402B0SE	400	GL3ZR402B0SE	250	GL3JR402B0S3	200
		Colorless transparency	•					GL3ZV802B0SE	200	GL3ZS802B0SE	210	GL3ZJ802B0SE	230	GL3ZR802B0SE	150		
		Milky diffusion	•					GL3JV404B0SE	280	GL3JS404B0SE	280	GL3JJ404B0SE	200				
	ø5	Colored diffusion	•														
		Colored transparency	•					GL3ZV152B0SE	2 700	GL5ZS152B0SE	3 000	GL5ZJ152B0SE	3 000	GL5ZR152B0SE	2 000		
		Colorless transparency	•					GL5ZV302B0SE	900	GL5ZS302B0SE	1 000	GL5ZJ302B0SE	900	GL5ZR302B0SE	600		
		Milky diffusion	•					GL5JV302B0SE	640	GL5JS302B0SE	680	GL5JJ302B0SE	570				
ø10	Colored diffusion	•															
	Colored transparency	•					GL0ZV042B0S	16 900	GL0ZS042B0S	22 600	GL0ZJ042B0S	18 500					
Oval	Long: 5.8 Short: 4.6	Colored diffusion	•														
		Colored transparency	•					GL6ZV27	750	GL6ZS27	850	GL6ZJ27	750	GL6ZR27	360		
		Colorless transparency	•														
		Milky diffusion	•					GL5JV7D2D0SE	210	GL5JS7D2D0SE	230	GL5JJ7D2D0SE	190				

Taped model is also available.

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HIGH-LUMINOSITY LED LAMPS

☆New product



High-Luminosity LED Lamps

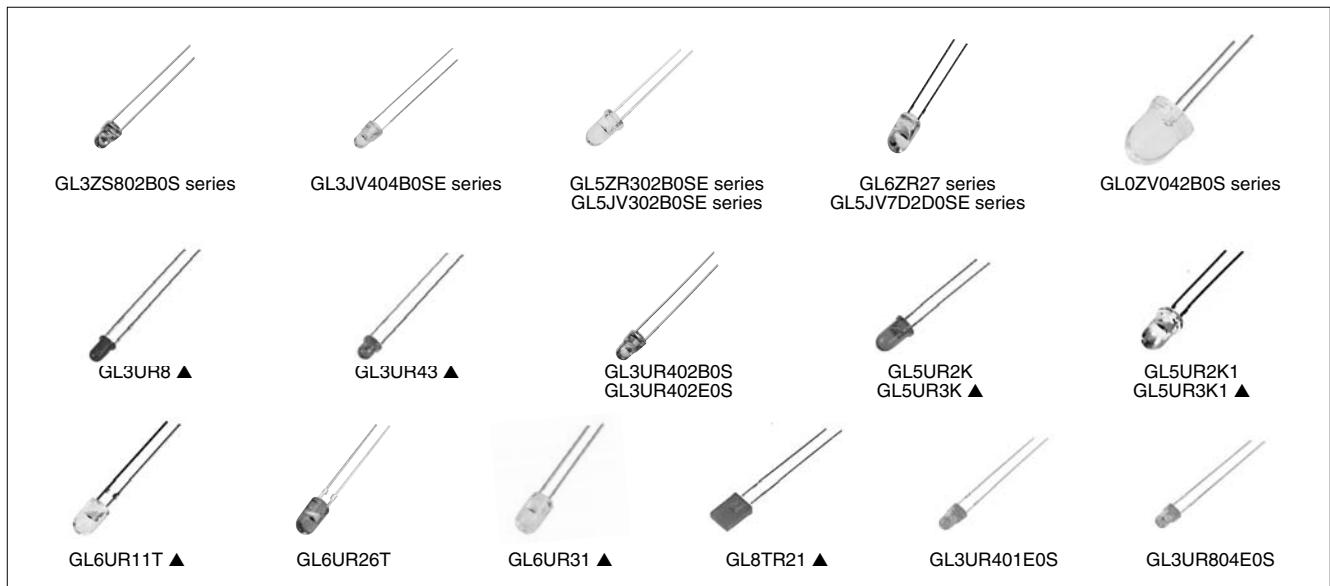
(If = 20 mA, Ta = 25°C)

Appearance	Radiation shape (mm)	Resin type				High-luminosity								
		Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	BC (Blue)		GC (Green)		TR, T (Red)		UR, U (Red)		
						Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	Model No.	Luminous intensity (mcd) TYP.	
Cylinder	ø3	●								GL3TR8 ▲	60	GL3UR8 ▲	300	
		●										☆GL3UR401E0S	250	
				●						GLTR44 ▲	110	GL3UR44 ▲	250	
				●								☆GL3UR402E0S	300	
			●							GL3TR43 ▲	20	GL3UR43 ▲	100	
			●									☆GL3UR804E0S	150	
				●			GL3BC302B0S2	900					☆GL3UR404E0S	250
	ø5												GL3UR402B0S	350
			●								GL5TR8 ▲	80		
													GL5UR44	850
				●									GL5UR2K	2 000
				●									GL5UR3K ▲	3 000
				●							GL5TR43 ▲	500	GL5UR2K1	2 000
Oval	Long: 5.8 Short: 4.6											GL5UR3K1 ▲	3 000	
												GL6UR11T*1 ▲	300	
		●										GL6UR31 ▲	950	
Rectangle	2.5 × 5.0											GL6UR26T*1	400	
	1.8 × 3.9	●								GL8TR21 ▲	4	GL8UR21	16	
		●								GL8TR42 ▲	4			

*1 With tie-bar

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

Taped model is also available.



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☆New product



LED Lamps (1)

(I_F = 20 mA*1, T_a = 25°C)

Appearance	Radiation shape (mm)	Resin type				KG Green		JG Green		EG Yellow-green		FG Yellow-green (HL)		
		Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	(555 nm)	Luminous intensity (mcd) TYP.	(560 nm)	Luminous intensity (mcd) TYP.	(565 nm)	Luminous intensity (mcd) TYP.	(565 nm)	Luminous intensity (mcd) TYP.	
Cylinder	ø3	●				GL3KG8 ▲	30			GL3EG8 ▲	60			
		●						☆GL3JG401E0S	80	☆GL3EG401E0S	80			
			●							GL3EG41 ▲	130			
				●			GL3KG44 ▲	60			GL3EG44 ▲	130		
					●				☆GL3JG402E0S	85	☆GL3EG402E0S	85		
				●			GL3KG43 ▲	20			GL3EG43 ▲	38		
				●					☆GL3JG804E0S	40	☆GL3EG804E0S	40		
				●			GL3KG62 ▲	22			GL3EG62 ▲	65		
				●					☆GL3JG404E0S	80	☆GL3EG404E0S	80		
				●			GL3KG63 ▲	6			GL3EG63 ▲	18		
			●							LT3E31W*2 ▲	18			
			●							LT3E65W*2 ▲	25			
		ø4	●				GL4KG8 ▲	30	☆GL4JG8	85	GL4EG8	100		
			●								GL5EG4 ▲	20		
			●				GL5KG8 ▲	60	☆GL5JG8	140	GL5EG8	150		
			●				GL5KG41 ▲	70	☆GL5JG41	160	GL5EG41	160		
		ø5		●			GL5KG44 ▲	70	☆GL5JG44	160	GL5EG44	160		
				●							GL5EG40	250		
					●			GL5KG43 ▲	120	☆GL5JG43	360	GL5EG43	300	GL5FG43 ▲
					●						GL5EG60 ▲	23		
			●							GL6EG11T*3 ▲	120			
	ø5 (Inverted cone)	●								GL5EG47 ▲	15			
Oval	Long: 5.8 Short: 4.6	●								GL6EG26T*3	140			
Convex	ø2	●								GL2EG6 ▲	15			
Arch	2.5 × 5.0	●								GL8EG2 ▲	30			
	2.0 × 3.1	●								GL8EG4 ▲	50			
Rectangle	1.8 × 3.9	●				GL8KG42 ▲	1.5			GL8EG42 ▲	5			
	1.9 × 3.9	●								GL8EG5 ▲	28			
	2.0 × 3.2	●				GL8KG25 ▲	9			GL8EG25 ▲	12			
	2.0 × 3.2	●				GL8KG29 ▲	5			GL8EG29 ▲	12			
	2.0 × 4.5	●								GL8EG23	6			
	2.0 × 5.0	●				GL8KG21 ▲	4	☆GL8JG21	7	GL8EG21	8			
		●			GL8KG26 ▲	4			GL8EG26 ▲	8				
Square	5.0 × 5.0	●				GL8KG22 ▲	3.5	☆GL8JG22	8	GL8EG22	6			
Triangle	Isosceles triangle	●												

*1 PR series (Red): I_F = 5 mA (GL8PR25, GL8PR29: I_F = 10 mA)

*2 Taped model

*3 With tie-bar

HL: High-luminosity

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Taped model is also available.

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LED Lamps (2)

(I F = 20 mA*1, Ta = 25°C)

Appearance	Radiation shape (mm)	Resin type				HY Yellow (585 nm)		HS Sunset orange (610 nm)		HD Red (635 nm)		PR Red (695 nm)		
		Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Luminous intensity (mcd) TYP.	Luminous intensity (mcd) TYP.	Luminous intensity (mcd) TYP.	Luminous intensity (mcd) TYP.	Luminous intensity (mcd) TYP.	Luminous intensity (mcd) TYP.			
Cylinder	ø3	●				GL3HY8 ▲	55	GL3HS8 ▲	60	GL3HD8 ▲	40	GL3PR8 ▲	8	
		●				☆GL3HY401E0S	60	☆GL3HS401E0S	60	☆GL3HD401E0S	60			
			●											
				●		GL3HY44 ▲	100	GL3HS44 ▲	100	GL3HD44 ▲	110	GL3PR44 ▲	12	
					●	☆GL3HY402E0S	70	☆GL3HS402E0S	70	☆GL3HD402E0S	70			
			●			GL3HY43 ▲	25	GL3HS43 ▲	25	GL3HD43 ▲	25	GL3PR43 ▲	3	
			●			☆GL3HY804E0S	30	☆GL3HS804E0S	30	☆GL3HD804E0S	30			
			●			GL3HY62 ▲	40	GL3HS62 ▲	40	GL3HD62 ▲	50			
			●			☆GL3HY404E0S	60	☆GL3HS404E0S	60	☆GL3HD404E0S	60			
			●			GL3HY63 ▲	16	GL3HS63 ▲	15	GL3HD63 ▲	17	GL3PR63 ▲	2	
		●			LT3H31W*2 ▲	15			LT3D31W*2 ▲	15	LT3P31W*2 ▲	1.5		
		●			LT3H65W*2 ▲	25	LT3S65W*2 ▲	25	LT3D65W*2 ▲	25	LT3P65W*2 ▲	3		
		ø4	●			GL4HY8	110	GL4HS8	80	GL4HD8	110	GL4PR8 ▲	15	
			●							GL5HD4 ▲	25	GL5PR4 ▲	3	
			●			GL5HY8	120	GL5HS8	80	GL5HD8	80	GL5PR8 ▲	15	
			●			GL5HY41	100	GL5HS41	100	GL5HD41	150	GL5PR41 ▲	15	
			●		●	GL5HY44	100	GL5HS44	100	GL5HD44	100	GL5PR44 ▲	15	
			●			GL5HY40	250	GL5HS40	200	GL5HD40	250	GL5PR40 ▲	35	
		ø5		●		GL5HY43	250	GL5HS43	250	GL5HD43	300			
			●							GL5HD60 ▲	8			
	ø5 (Inverted cone)	●					GL5HS47 ▲	6	GL5HD47 ▲	8				
Oval	Long: 5.8 Short: 4.6	●												
Convex	ø2	●			GL2HY6 ▲	12			GL2HD6 ▲	12	GL2PR6 ▲	1.5		
Arch	2.5 × 5.0	●							GL8HD2 ▲	30				
	2.0 × 3.1	●							GL8HD4 ▲	40				
Rectangle	1.8 × 3.9	●			GL8HY42 ▲	6			GL8HD42 ▲	5	GL8PR42 ▲	0.7		
	1.9 × 3.9	●			GL8HY5 ▲	25			GL8HD5 ▲	22				
	2.0 × 3.2	●			GL8HY25 ▲	12	GL8HS25 ▲	10	GL8HD25 ▲	12	GL8PR25 ▲	1.5		
	2.0 × 3.2	●			GL8HY29 ▲	10	GL8HS29 ▲	7			GL8PR29 ▲	3		
	2.0 × 4.5	●			GL8HY23	8			GL8HD23	6				
	2.0 × 5.0	●			GL8HY21	8	GL8HS21	8	GL8HD21	8	GL8PR21 ▲	0.7		
		●			GL8HY26 ▲	8			GL8HD26 ▲	8	GL8PR26 ▲	0.7		
Square	5.0 × 5.0	●			GL8HY22	5	GL8HS22	5	GL8HD22	8	GL8PR22 ▲	1.2		
Triangle	Isosceles triangle	●									GL8PR28 ▲	0.9		

*1 PR series (Red): I F = 5 mA (GL8PR25, GL8PR29; I F = 10 mA)

*2 Taped model

Taped model is also available.

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

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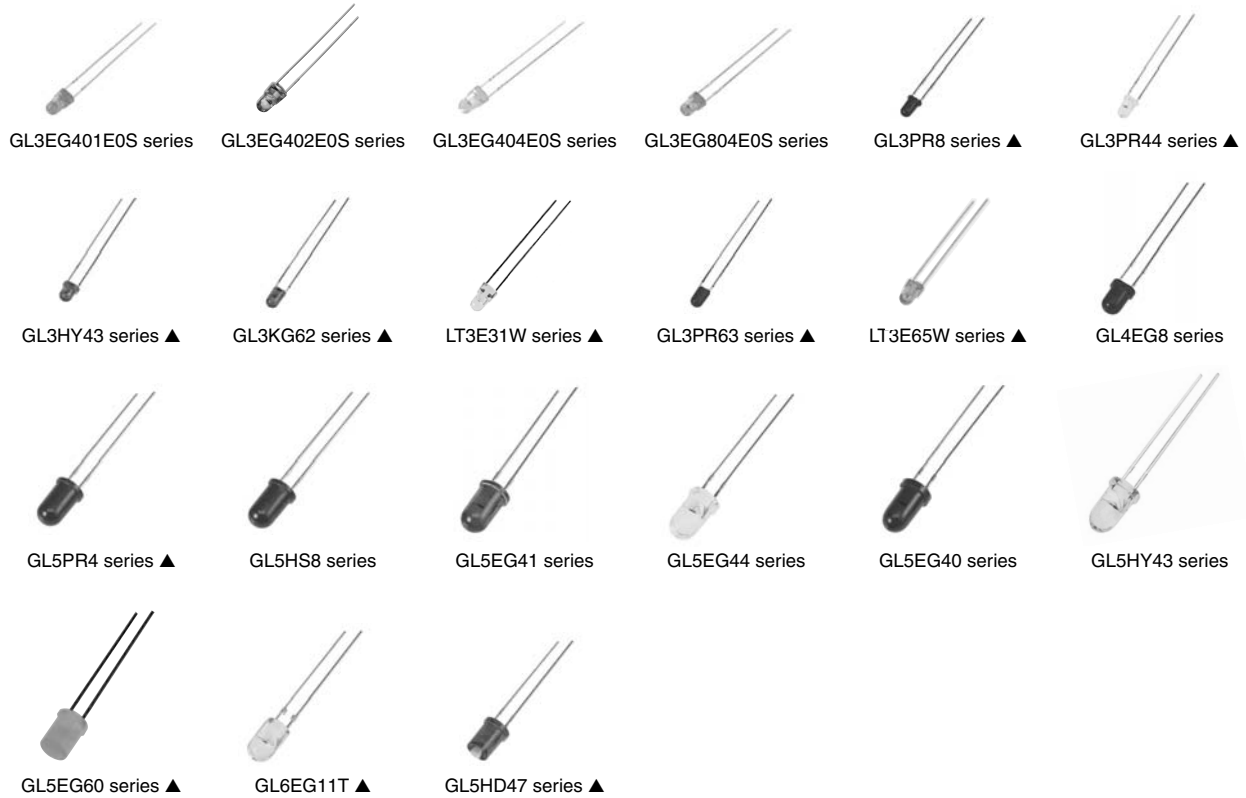
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Cylinder



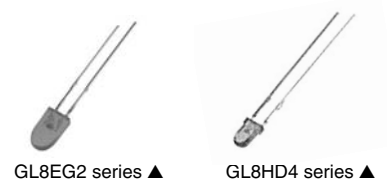
Oval



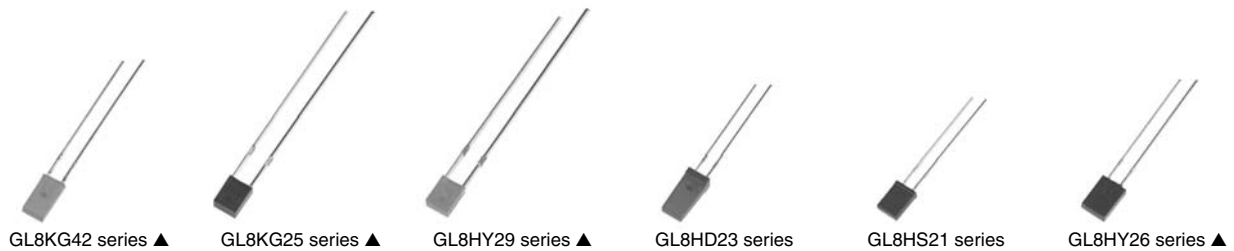
Convex



Arch



Rectangle



Square



Triangle



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DICHROMATIC LED LAMPS



■ Dichromatic LED Lamps

(The values in luminous intensity are radiation color order) (I_F = 20 mA*1, T_a = 25°C)

Appearance	Radiation shape (mm)	Resin type				E J J		C U *		E P		E D		E H		H P	
		Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Yellow-green + Orange (HL)	Luminous intensity (mcd) TYP.	Yellow-green + Red (HL)	Luminous intensity (mcd) TYP.	Yellow-green + Red	Luminous intensity (mcd) TYP.	Yellow-green + Red	Luminous intensity (mcd) TYP.	Yellow-green + Yellow	Luminous intensity (mcd) TYP.	Yellow + Red	Luminous intensity (mcd) TYP.
Cylinder	ø3				●							GL3ED8	20/15				
	ø5					GL5EJJ502C0X*2	110/170			GL5EP5 ▲	40/9	GL5ED5	40/25			GL5HP5 ▲	15/9
									GL5CU44 ▲	100/240			GL5ED44	80/50			
Rectangle	1.9 × 3.9											GL5ED60 ▲	11/8				
	2.0 × 5.0							GL6CU7 ▲	120/250							GL8ED5 ▲	10/6.5
	5.0 × 5.0											GL8ED2	8/3	GL9EH2 ▲	6/2	GL8HP5 ▲	3/1.5
												GL9ED4	7/4			GL9HP2 ▲	1/0.8

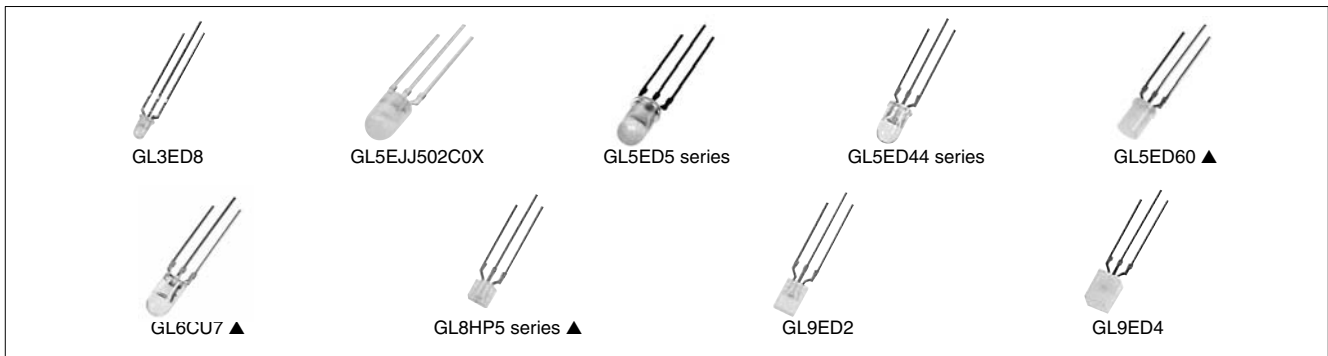
* CU series: Common anode pin connection

*1 P (Red) and H (yellow): I_F = 10 mA

*2 Taped model

HL: High-luminosity

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☆New product



High-Luminosity (AlGaInP) Chip LEDs (Taped Models Only)

(I_F = 20 mA, T_a = 25°C*3)

Outline dimensions (mm)	Resin type				JG		JESE		ZVJV		ZSJS		ZJJJ		ZRJR	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Green	Luminous intensity (mcd) TYP.	Yellow-green	Luminous intensity (mcd) TYP.	Amber	Luminous intensity (mcd) TYP.	Sunset orange	Luminous intensity (mcd) TYP.	Orange	Luminous intensity (mcd) TYP.	Red	Luminous intensity (mcd) TYP.
1.6 × 0.8 (T: 0.35)			●				GM1JE35200AE*1	13	GM1JV35200AE*1	18.8	GM1JS35200AE*1	19	GM1JJ35200AE*1	19	GM1JR35200AE*1	13
1.6 × 0.8 (T: 0.55)			●				GM1JE55200AE*1	13	GM1JV55200AE*1	16.8	GM1JS55200AE*1	20.9	GM1JJ55200AE*1	19		
1.6 × 0.8 (T: 0.8)			●						GM1ZV80300AE	75	GM1ZS80300AE	75	GM1ZJ80300AE	75	GM1ZR80300AE	55
			●	☆	☆	☆	☆GM1JG80300AE	15	☆GM1JE80300AE	16.5	☆LT1JV67A*1	14.1			☆LT1JR67A	10
2.0 × 1.25 (T: 0.8)			●						GM1ZV40300AE	60	GM1ZS40300AE	78	GM1ZJ40300AE	60	GM1ZR40300AE	55
			●	☆			☆LT1JG40A	15	GM1JV40300AE	11	GM1JS40300AE	12	GM1JJ40300AE	9.5	☆LT1JR40A	9
3.2 × 2.8 (T: 1.9)			●						☆GM5ZV96270A	600					☆GM5ZR96270A	600
			●						GM5ZV96260AE	320					GM5ZR96260AE	300
6.0 × 5.0 (T: 2.5)			●						GM5ZV01200A*2	500	GM5ZS01200A*2	700	GM5ZJ01200A*2	500	GM5ZR01200A*2	400
			●				GM5SE01200A*2	400					GM5SJ01250AL*2	1 050		
6.0 × 5.0 (T: 2.3) (board insertion type)			●						GM5ZV03200Z*2	500	GM5ZS03200Z*2	700	GM5ZJ03200Z*2	500	GM5ZR03200Z*2	400
2.8 × 1.2 (T: 0.8) (Side emitting)			●						☆GM4ZV83200AE	(100)	☆GM4ZS83200AE	(150)	☆GM4ZJ83200AE	(150)	GM4ZR83200AE	(90)
5.0 × 5.0 (T: 1.5)			●												GM5ZR05240A	3 000

*1 LT1JS67A, LT1JV67A, GM1JV55200AE series, GM1JV35200AE series, GM1JV40300AE series: I_F = 5 mA

*2 GM5ZR01200A series, GM5ZR03200Z series: I_F = 60 mA

*3 GM5ZV96260AE series, GM5ZV96270A series, GM5ZV01200A series, GM5ZV03200Z series: T_c = 25°C

High-Luminosity (InGaN) Chip LEDs (Taped Models Only)

(I_F = 10 mA, T_a = 25°C*5)

Outline dimensions (mm)	Resin type				BC		GC	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Blue	Luminous intensity (mcd) TYP.	Green	Luminous intensity (mcd) TYP.
1.6 × 0.8 (T: 0.35)				●	GM1BC35370AC*1	23		
1.6 × 0.8 (T: 0.55)			●		GM1BC55255AC*1	23	GM1GC55310AC*4	100
3.2 × 2.8 (T: 1.9)			●		☆GM5BC96270A*2	500	☆GM5GC96270A	1 300
			●		GM5BC96260AC*2	300	GM5GC96260AC*2	700
6.0 × 5.0 (T: 2.5)			●		GM5BC01250AC*3	400	GM5GC01250AC*3	1 200
6.0 × 5.0 (T: 2.3) (board insertion type)			●		GM5BC03210Z*3	400	GM5GC03210Z*3	1 200
2.8 × 1.2 (T: 0.8) (Side emitting)			●		☆GM4BC83211AC*2	(120)		
5.0 × 5.0 (T: 1.5)			●		GM5BC05240AC*2	2 000	GM5GC05240AC*2	4 000

*1 GM1BC35370AC, GM1BC55255AC: I_F = 5 mA

*2 GM5BC96260AC series, GM5BC96270A series, GM4BC83211AC, GM5BC05240AC series: I_F = 20 mA

*3 GM5BC01250AC series, GM5BC03210Z series: I_F = 50 mA

*4 GM1GC55310AC: I_F = 10 mA

*5 GM5BC96260AC series, GM5BC96270A series, GM5BC01250AC series, GM5BC03210Z series: T_c = 25°C

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■ Chip LEDs (Taped Models Only)

(If = 20 mA*, Ta = 25°C)

Outline dimensions (mm)	Resin type				Green	Luminous intensity (mcd) TYP.	E F E G		Yellow-green	Luminous intensity (mcd) TYP.	H H Y		Yellow	Luminous intensity (mcd) TYP.
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion										
1.6 × 0.8 (T: 0.35)			●					GM1EG35200A	19					
1.6 × 0.8 (T: 0.55)			●					GM1EG55200A	19		GM1HY55200A	11.5		
1.6 × 0.8 (T: 0.8)				●	LT1K67A ▲	3.8		LT1E67A LT1F67A LT1F67AF	23		LT1H67A	8.3		
2.0 × 1.25 (T: 0.8)				●	LT1K40A ▲	5		LT1E40A	19		LT1H40A	10.8		
3.2 × 2.8 (T: 1.9)			●					GM5EG95200A	18.1					

Outline dimensions (mm)	Resin type				S H S		D H D		U U R		P	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Sunset orange	Luminous intensity (mcd) TYP.	Red	Luminous intensity (mcd) TYP.	Red (HL)	Luminous intensity (mcd) TYP.	Red	Luminous intensity (mcd) TYP.
1.6 × 0.8 (T: 0.55)			●		GM1HS55200A	11.4	GM1HD55200A	12.5	GM1UR55200A	29.7		
1.6 × 0.8 (T: 0.8)				●	LT1S67A	6.9	LT1D67A	8.8	LT1U67A	29.7	LT1P67A ▲	1.3
2.0 × 1.25 (T: 0.8)				●	LT1S40A	9.4	LT1D40A	11.9	LT1U40A	35.6	LT1P40A ▲	1.3
3.2 × 2.8 (T: 1.9)			●				GM5HD95200A	13.8	GM5UR95200A	80		

*1 P (Red) series: If = 5 mA

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

HL: High-luminosity

LT1D67A series
LT1JS67A series
GM1ZV80300AE series

GM1EG55200A series
GM1JV55200AE series
GM1BC55255AC series

LT1E40A series
GM1JV40300AE series
GM1ZV40300AE series

GM1JV35200AE series
GM1EG35200A
GM1BC35370AC

GM4BC83211AC

GM5ZR05240A
GM5BC05240AC series

GM5EG95200A series
GM5ZV96260AE series, GM5ZV96270A series,
GM5BC96260AC series, GM5BC96270A series

GM5ZR01200A series
GM5BC01250AC series

GM5ZV03200Z series
GM5BC03210Z series

Taped model

■ High-Luminosity Dichromatic Type Chip LEDs (Taped Models Only)

(If = 40 mA, Tc = 25°C)

Outline dimensions (mm)	Resin type				BC GC		BC ZR		GC ZR	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion	Blue + Green	Luminous intensity (mcd) TYP.	Blue + Red	Luminous intensity (mcd) TYP.	Green + Red	Luminous intensity (mcd) TYP.
6.0 × 5.0 (T: 2.5)			●		GM5BG01210A	300/860	GM5ZRB01210A	300/580	GM5ZRG01210A	860/580

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■ Dichromatic Type Chip LEDs (Taped Models Only)

(I_F = 20 mA, T_a = 25°C)

Outline dimensions (mm)	Resin type					EH Yellow-green + Yellow		ED Yellow-green + Red		KS Green + Sunset orange	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion		Luminous intensity (mcd) TYP.		Luminous intensity (mcd) TYP.		Luminous intensity (mcd) TYP.	
1.6 × 1.6 (T: 0.8)				●	LT1EH67A	19/8.3	LT1ED67A	19/8.3	LT1KS67A ▲	3.8/6.9	

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.



GM5BG01210A series

LT1ED67A series

■ High-Luminosity White Type Chip LEDs (Taped Models Only)

(T_a = 25°C^{*5})

Outline dimensions (mm)	Color coordinates (x, y)	Radiation color	BW White	
				Luminous intensity (mcd) TYP.
2.8 × 1.2 (T: 0.8) Side view type	(0.30, 0.29)	White	☆GM4BW84310A ^{*1}	1 550
			☆GM4BW84320A ^{*1}	1 850
			☆GM4BW84330A ^{*1}	2 050
3.85 × 1.0 (T: 0.6) Side view type	(0.30, 0.29)	White	☆GM4BW64310A ^{*1}	1 500
			☆GM4BW64320A ^{*1}	1 800
			☆GM4BW64330A ^{*1}	2 000
3.85 × 1.0 (T: 0.5) Side view type	(0.30, 0.29)	White	☆GM4BW53340A ^{*1}	1 800
2.04 × 1.64 (T: 0.7)	(0.31, 0.31)	White	★GM1BW70301A ^{*4}	11 000
3.2 × 2.8 (T: 1.9)	(0.31, 0.31)	White	GM5BW96320A ^{*1}	1 400
			☆GM5BW96370A ^{*1}	2 000
3.2 × 2.8 (T: 1.4)	(0.31, 0.31)	White	GM5BW94320A ^{*1}	3 800
5.0 × 5.0 (T: 1.5)	(0.31, 0.31)	White	GM5BW05340A ^{*1}	10 000
5.0 × 5.0 (T: 1.6)	(0.31, 0.31)	White	☆GM5BW05343A ^{*2}	20 000
6.0 × 5.0 (T: 1.5) 6-terminal leadless	(0.31, 0.31)	White	GM5BW01300A ^{*2}	4 200
6.0 × 5.0 (T: 2.5) 4-terminal leadless	(0.31, 0.31)	White	GM5BW01301A ^{*3}	1 800
			☆GM5BW01311A ^{*3}	3 300

^{*1} GM4BW84310A series, GM4BW64310A series, GM4BW53340A, GM5BW96320A, GM5BW96370A, GM5BW94320A, GM5BW05340A: I_F = 20 mA

^{*2} GM5BW05343A, GM5BW01300A: I_F = 35 mA/chip

^{*3} GM5BW01301A series: I_F = 40 mA

^{*4} GM1BW70301A series: I_F = 200 mA

^{*5} GM5BW96320A, GM5BW96370A, GM5BW01300A, GM5BW01301A series: T_c = 25°C

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☆New product
★Under development



■ Pastel Color Chip LEDs (Taped Models Only)

(I_F = 20 mA, T_c = 25°C)

Outline dimensions (mm)		CA		CY		CV			
		Light blue		Lemon yellow		Purple			
		Color coordinates (x, y)	Luminous intensity (mcd) TYP.	Color coordinates (x, y)	Luminous intensity (mcd) TYP.	Color coordinates (x, y)	Luminous intensity (mcd) TYP.		
3.2 × 2.8 (T: 0.9)	☆GM5CA96320A	(0.17, 0.20)	1 000	★GM5CY96320A	(0.42, 0.48)	1 500	★GM5CV96320A	(0.35, 0.15)	500

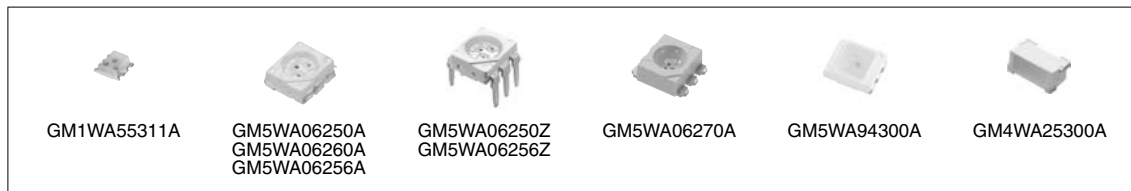


■ High-Luminosity Dichromatic Type Chip LEDs (RGB 3-color) (Taped Models Only)

(T_a = 25°C*9)

Outline dimensions (mm)	Resin type				WA	Luminous intensity (mcd) TYP.	
	Colored diffusion	Colored transparency	Colorless transparency	Milky diffusion			Red + Green + Blue
1.6 × 1.6 (T: 0.55)				●	GM1WA55311A*5	20/70/23	
3.2 × 2.8 (T: 1.4)				●	★GM5WA94300A*7	(1 800) [Mixed color]	
5.0 × 2.5 (T: 2.5)				●	★GM4WA25300A*8	(2 200) [Mixed color]	
6.0 × 5.0 (T: 2.5) 6-terminal leadless				●	GM5WA06250A*2	1 400 [Mixed color]	
				●	GM5WA06260A*1	1 725 [Mixed color]	
				●	GM5WA06256A*6	1 500 [Mixed color]	
				●	GM5WA06270A*3, 4	3 000 [Mixed color]	
6.0 × 5.0 (T: 2.3 [resin part]) 6-terminal				●	GM5WA06250Z*2	1 400 [Mixed color]	
				●	GM5WA06256Z*6	1 500 [Mixed color]	

- *1 GM5WA06260A: I_F = 40 mA (Red, Green), I_F = 20 mA (Blue)
- *2 GM5WA06250A, GM5WA06250Z: I_F = 35 mA (Red, Green), I_F = 20 mA (Blue)
- *3 GM5WA06270A: I_F = 35 mA (Red, Green, Blue)
- *4 GM5WA06270A: T: 2.4 mm
- *5 GM1WA55311A: I_F = 5 mA (Red, Green, Blue)
- *6 GM5WA06256A: I_F = 22 mA (Red), I_F = 35 mA (Green), I_F = 13 mA (Blue)
- *7 GM5WA94300A: I_F = 20 mA (Red), I_F = 20 mA (Green), I_F = 7 mA (Blue)
- *8 GM4WA25300A: I_F = 21 mA (Red), I_F = 25 mA (Green), I_F = 7 mA (Blue)
- *9 GM1WA55311A, GM5WA94300A, GM4WA25300A, GM5WA06250A series: T_c = 25°C



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LED

■ Laser Diodes

◆ Model Configurations

Wavelength (nm)	Optical power output (Pulse) (mW) MAX.	Package			
		ø5.6 mm Metal type	ø3.3 mm Metal type	1.8 mm t Resin type	ø5.6 mm Resin type
405 band	20*1	☆GH04020A2G			
	210	☆GH04P21A2G			
650 band	240	GH06P24A2C		GH16P24A8C	
	350			☆GH16P35A8C	
780 band	5*1	GH07805C2K			GH17805B2AS
	25*1	GH07825C2K			
	240	GH07P24C1C	GH07P24C4C	GH17P24C8C	
	280	GH07P28A1C	GH07P28A4C	☆GH17P28A8C	

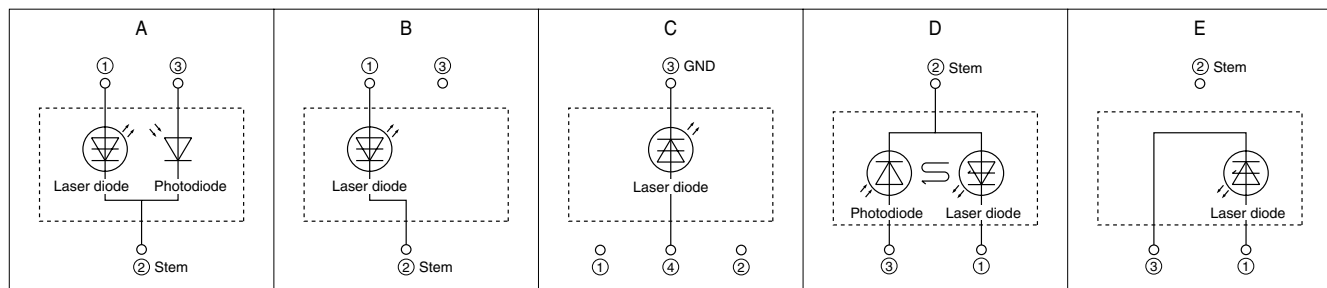
*1 Optical power output (CW) MAX. (mW)

◆ Specifications

(Tc = 25°C)

Model No.	Wave-length (nm)	Optical power output (mW) MAX.		Features	Applications	Terminal connections
		CW	Pulse			
☆GH04020A2G	405 band	20	—	ø5.6 mm CAN package, operating temperature: 70°C MAX.	Next generation DVD playback	E
☆GH04P21A2G		105	210	ø5.6 mm CAN package, operating temperature: 70°C MAX.	Next generation DVD recording	
GH06P24A2C	650 band	100	240	ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	Double-layer DVD x4 writing	B
GH16P24A8C		100	240	1.8 mm frame package, operating temperature: 75°C MAX. (pulse drive)	Double-layer DVD x4 writing	C
GH16P35A8C		125	350	1.8 mm frame package, operating temperature: 75°C MAX. (pulse drive)	Double-layer DVD x16 writing	
GH17805B2AS	780 band	5	—	ø5.6 mm frame package, operating temperature: 70°C MAX., with built-in monitor PD	CD-ROM, CD-Audio	A
GH07805C2K		5	—	ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD	Printer, copier, complex machine	D
GH07825C2K		25	—	ø5.6 mm CAN package, operating temperature: 60°C MAX., with built-in monitor PD	Printer, copier, complex machine	
GH07P24C1C		120	240	ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (MAX. x48 to x52 writing)	B
GH07P28A1C		150	280	ø5.6 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (MAX. x48 to x52 writing)	
GH07P24C4C		120	240	ø3.3 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. x48 to x52 writing)	
GH07P28A4C		150	280	ø3.3 mm CAN package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. x48 to x52 writing)	
GH17P24C8C		120	240	1.8 mm frame package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. x48 to x52 writing)	C
GH17P28A8C		150	280	1.8 mm frame package, operating temperature: 75°C MAX. (pulse drive)	CD-R/RW (H/H, slim dual-purpose) (MAX. x48 to x52 writing)	

• Terminal Connections



Notice

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 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

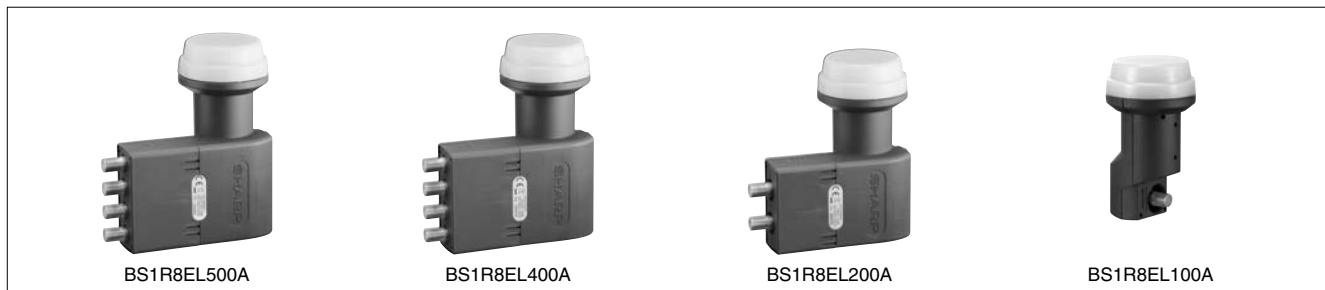
■ Europe: LNBs for Satellite Broadcast

◆ Features

- (1) Wide band type receiving all broadcasting channels (analog & digital) of Europe. [Universal LNB]
- (2) Originally developed feed-horn waveguide makes the wide-band, low-noise characteristics possible.
- (3) One of the industry's most compact and lightweight package
- (4) Low consumption current design for energy saving [80 mA (TYP.): BS1R8EL100A]

◆ Specifications

Destination	Europe, Astra/Eutelsat Satellite etc.			
Receiving polarization	Horizontal/Vertical polarization			
Model No. <Type>	BS1R8EL500A <4 output>	BS1R8EL400A <4 output>	BS1R8EL200A <2 output>	BS1R8EL100A <1 output>
Input frequency (GHz)	10.7 to 11.7 [Low band], 11.7 to 12.75 [High band]			
Output frequency (MHz)	950 to 1 950 [Low band], 1 100 to 2 150 [High band]			
Local oscillation frequency (GHz)	9.75 [Low band], 10.6 [High band]			
NF (dB)	0.7 (TYP.)			
Conversion gain (dB)	56 (TYP.)			
Phase noise	-55 dBc/Hz @ 1 kHz (TYP.)			
Cross-polar discrimination (dB)	25 (TYP.)			
Supply voltage (V DC) (Polarization switching voltage)	Vertical polarization	11.5 to 14.0 (0/22 kHz)		
	Horizontal polarization	16.0 to 19.0 (0/22 kHz)		
Current consumption (mA)	210 (TYP.)/250 (MAX.)	310 (TYP.)/350 (MAX.)	190 (TYP.)/250 (MAX.)	80 (TYP.)/120 (MAX.)
Waveguide	Feed-horn (F/D = 0.6)			
Output impedance (Ω)	75			
Output connector (F-type)	4-output (H/H, H/L, V/H, V/L)	4-output (H/V, High and low switching)	2-output (H/V, High and low switching)	1-output (H/V, High and low switching)
Outline dimensions (mm)	133.0 × 103.6 × 60.0	133.0 × 103.6 × 60.0	123.5 × 97.0 × 60.0	107.3 × 60.0 × 60.0
Weight (g)	Approx. 255	Approx. 256	Approx. 215	Approx. 110



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Japan/Asia/Australia: LNBs for CS Digital Satellite Broadcast

◆ Specifications

Destination	Japan, Asia, Australia, CS Satellite	
Receiving polarization	Horizontal/Vertical polarization	
Model No. <Type>	BS1R8AR100A	
Input frequency (GHz)	11.70 to 12.75	
Output frequency (MHz)	1 000 to 2 050	
Local oscillation frequency (GHz)	10.7	
NF (dB)	0.7 (TYP.) / 0.9 (MAX.)	
Conversion gain (dB)	55 to 64	
Phase noise	-75 dBc/Hz @ 1 kHz (TYP.)	
Cross-polar discrimination (dB)	25 (TYP.)	
Supply voltage (V DC) (Polarization switching voltage)	Vertical polarization	11.5 to 14.0
	Horizontal polarization	16.0 to 19.0
Current consumption (mA)	80 (TYP.)/120 (MAX.)	
Waveguide	Feed-horn (F/D = 0.6)	
Output impedance (Ω)	75	
Output connector (F-type)	1-output (H/V switching)	
Outline dimensions (mm)	107.3 × 60 × 60	
Weight (g)	Approx. 110	



Japan: LNBs for BS/CS 110° Satellite Broadcast

◆ Features

- (1) Can receive 2 satellite broadcasts of 110° BS/CS digital
[Employs wide-band (1 GHz) circular' linear polarization conversion technology (septum waveguide structure)]
- (2) Outstanding noise figure (NF) characteristics enabling compact design of antenna diameter. [NF: 0.45 dB (TYP.)/BS1F6JU300A]
- (3) Low current consumption design for improved energy saving. [80 mA (TYP.)]

◆ Standard Specifications

Destination	Japan BS/CS 110° Satellite		
Receiving polarization	Right circular polarization		Right/Left circular polarization
Model No.	BS1F6JU300A	BS1F6JP300A	BS1F6JP100A
Input frequency (GHz)	11.71023 to 12.751		
Output frequency (MHz)	1 032.23 to 2 073		
Local oscillation frequency (GHz)	10.678		
NF (dB)	0.45 (TYP.) / 0.6 (MAX.)	0.7 (TYP.) / 1.1 (MAX.)	
Conversion gain (dB)	48 to 60		
Phase noise	-65 dBc/Hz @ 1 kHz (TYP.)		
Cross-polar discrimination (dB)	25 (TYP.)/20 (MIN.)		
Supply voltage (V DC) (Polarization switching voltage)	Right circular polarization	9.5 to 18.0	13.5 to 16.5
	Left circular polarization	—	9.5 to 12.0
Current consumption (mA)	80 (TYP.)/110 (MAX.)		
Waveguide	Feed-horn (F/D = 0.5)		
Output impedance (Ω)	75		
Output connector (F-type)	1-output	1-output (R/L switching)	
Outline dimensions (mm)	96 × 53.07 × 71		
Weight (g)	Approx. 130 (not including outer cabinet)		



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■ Digital DBS Front-End Units

DBs front-end unit for digital broadcasting features high quality of signal transmission and improved elimination ability of various kinds of rejection thanks to using Sharp's original ICs.

◆ Features

- (1) Equipped with a direct conversion IC developed by Sharp. Reliability is improved by reducing power consumption and component counts.
- (2) Wide-band reception design also covering CS broadcast band. [Reception frequency: 950 to 2 150 MHz]
- (3) Wide product line-up of LINK integrated types for contributing to set development time reduction. [Compatible with DVB-S/DVB-S2/ISDB-S/ABS-S demodulation]
- (4) User support tools can be provided. [Sample/evaluation boards and software are available.]

◆ Standard Specifications <IQ output type>

Destination	Global	
Demodulator system	DVB-S	ISDB-S/DVB-S2/ABS-S
Input type	1-input/1-loop through output	1-input
Model No.	BS2S7HZ0502	BS2S7HZ6306
Input frequency (MHz)	950 to 2 150	
Input signal level (dBm)	-65 to -25	
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)	
Base band frequency bandwidth	10 to 30, 2.0 MHz step (BB LPF)	
RF input local leak (dBm)	-70 and below	
Output type	I/Q	
Channel selection system	PLL (I ² C-bus)*1	
Noise figure (dB)	7 (TYP.)	
Tuning voltage (V DC)	Shared with a 3.3 V power source	
Supply voltage (V DC)	3.3	
LNB power supply	DC 25 V, 400 mA (MAX.)	
Input impedance (Ω)	75	
Outline dimensions (mm)	29.6 × 29.4 × 13.0	30.6 × 25.0 × 13.0

* Contact SHARP for custom design product. (Vertical chassis compatible)

*1 I²C-bus is a trademark of Philips Corporation.



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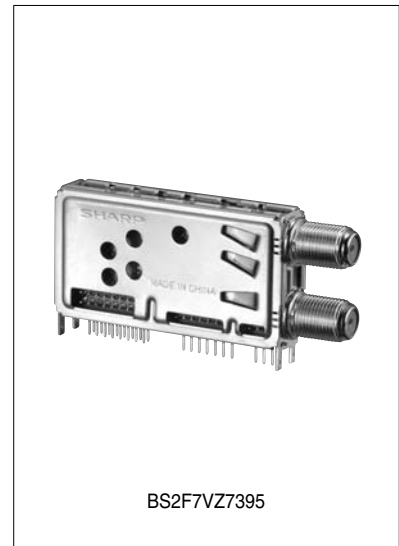
■ Digital DBS Front-End Units (QPSK Demodulator Circuit Built-in Type)

◆ Specifications <QPSK demodulator circuit built-in type>

Destination	Global
Input type	1-input, 1-loop through output
Model No.	BS2F7VZ7395
Input frequency (MHz)	950 to 2 150
Input signal level (dB m)	-65 to -25
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)
Base band frequency bandwidth (MHz)	10 to 30, 2.0 MHz step (BB LPF)
RF input local leak (dB m)	-70 and below
Output type	Transport stream (parallel/serial)
Symbol rate (M baud)	45 (MAX.)
Channel selection system	PLL (I ² C-bus)*1
Noise figure (dB)	7 (TYP.)
Tuning voltage (V DC)	Shared with a 3.3 V power source
Supply voltage (V DC)	3.3, 2.5
LNB power supply	25 V DC, 400 mA (MAX.)
Input impedance (Ω)	75
Outline dimensions (mm)	57.5 × 29.6 × 13.2

* Contact SHARP for custom design product.

*1 I²C-bus is a trademark of Philips Corporation.

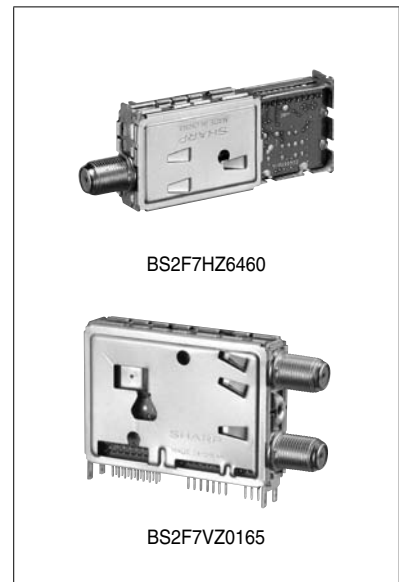


■ Digital DBS Front-End Units (8 PSK Demodulator Circuit Built-in Type)

◆ Specifications <8 PSK demodulator circuit built-in type>

Destination	Japan (ISDB-S)		Europe (DVB-S2)
	1-input	1-input, 1-loop through output	
Model No.	BS2F7HZ6460	BS2F7VZ0460	BS2F7VZ0165
Input frequency (MHz)	950 to 2 150		
Input signal level (dB m)	-65 to -25		
The 1st intermediate frequency (MHz)	Zero-IF (Direct conversion)		
Base band frequency bandwidth (MHz)	22 (BB LPF) variable type		10 to 30
RF input local leak (dB m)	-70 and below		
Output type	Transport stream (serial)	Transport stream (parallel/serial)	
Symbol rate (M baud)	28.86		10 to 30
Channel selection system	PLL (I ² C-bus)*1		
Noise figure (dB)	7 (TYP.)		
Tuning voltage (V DC)	Shared with a 3.3 V power source		
Supply voltage (V DC)	3.3, 1.5		3.3, 1.25
LNB power supply	25 V DC, 400 mA (MAX.)		
Input impedance (Ω)	75		
Outline dimensions (mm)	65.8 × 26.5 × 14.6	55.1 × 37.9 × 13.2	

*1 I²C-bus is a trademark of Philips Corporation.



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■ Combination Front-End Units for Digital Terrestrial, Analog Terrestrial and Digital Satellite Broadcasting

◆ Features

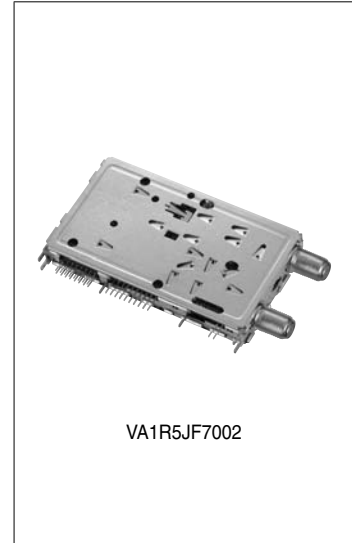
- (1) Enables simultaneous reception of digital terrestrial and digital satellite, or analog terrestrial and digital satellite, broadcasting.
- (2) Contributes to making LCD TVs, etc. thinner.

◆ Standard Specifications

Destination	Japan		
Model No.	VA1R5JF7002		
	Digital terrestrial	Analog terrestrial	Digital DBS
Input frequency (MHz)	VHF, UHF, CATV VHF Low: 93 to 167 VHF High: 173 to 399 UHF: 405 to 767		950 to 2 150
Input signal level*1 (dBm)	-75 to -20	-	-65 to -25
Output type	Transport stream	CVBS/SIF	Transport stream
IF bandwidth (MHz)	6		-
Base band frequency bandwidth	-		10 MHz to 30 MHz, 2.0 MHz step (BB LPF)
Noise figure (dB)	6 (TYP.)		6 (TYP.)
Phase noise (dBc/Hz)	-90 (TYP.) at 10kHz offset		-80 (TYP.) at 10kHz offset
Image rejection (dB)	65 (TYP.)		-
Channel selection system	PLL (I ² C-bus)*2		
Supply voltage (V DC)	1.5, 2.5, 3.3, 5.0		
Outline dimensions (mm)	85.5 × 45.2 × 12.7		

*1 It conforms to the ARIB standard.

*2 I²C-bus is a trademark of Philips Corporation.



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■ Front-End Units for ISDB-T/DVB-T/DTMB/CATV

◆ Features

- (1) Low phase noise characteristics, high elimination of adjacent channel interference.
- (2) Transport stream output front-end units with built-in OFDM demodulation IC. [VA1L5JF6013/VA1J5ED5055]
- (3) Compact, low power consumption.
- (4) Other types are available with various forms of chassis (vertical or horizontal type) and input connectors (F or DIN type), etc.

◆ Standard Specifications

Destination	Japan		Europe/Asia		
Product name	ISDB-T/S front end*1		DVB-T front end		DVB-T front end
Model No.	VA1J5JF7007		VA1T1ED5065	VA1H1ED5265	VA1K5ED5255
	Digital terrestrial	Digital satellite			
Input frequency (MHz)	VHF, UHF, CATV VHF Low: 93 to 167 VHF High: 173 to 399 UHF: 405 to 767	950 to 2 150	VHF: 143.5 to 430 UHF: 430 to 862		VHF: 146 to 430 UHF: 430 to 862
Output type	Transport stream (Built-in OFDM/8PSK demodulation)		Direct IF		Transport stream (Built-in OFDM demodulation)
IF bandwidth (MHz)	6	—	7, 8, selectable		
Noise figure (dB)	6 (TYP.)	8 (TYP.)	6 (TYP.)		
Phase noise	-90 dBc/Hz (TYP.) [at 10 kHz offset]	-80 dBc/Hz (TYP.)	-90 dBc/Hz (TYP.) [at 10 kHz offset]		
Image rejection (dB)	65 (TYP.)	—	55 (TYP.)		—
Channel selection system	PLL (I ² C-bus)*2				
Power consumption (W)	2.0*3		0.75	0.85	1.33
Supply voltage (V DC)	1.2, 2.5, 3.3, 5		5 (DC-DC converter)		5, 3.3, 1.8 (DC-DC converter)
Outline dimensions (mm)	70.0 x 40.0 x 12.7		52.0 x 35.9 x 13.4	47.7 x 29.6 x 13.2	70.0 x 29.6 x 13.2

*1 Enables simultaneous reception of digital terrestrial and digital satellite broadcasting.

*2 I²C-bus is a trademark of Philips Corporation.

*3 During simultaneous OFDM/8PSK demodulation operation.



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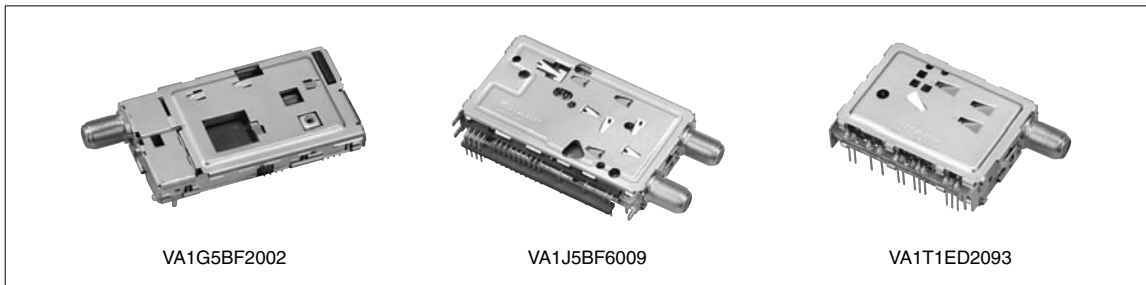
DIGITAL TERRESTRIAL FRONT-END UNIT



◆ Standard Specifications

Destination	Brazil		China	Europe/China/India	
Product name	ISDB-T front end		DTMB front end	CATV front end	
Model No.	VA1G5BF2002		VA1J5BF6009	VA1K5CD5405	
	Digital terrestrial	Analog terrestrial	Digital terrestrial	CATV	
Input frequency (MHz)	54 to 864		47 to 862		
Output type	Transport stream	Video/SIF	Transport stream	Direct IF	Transport stream
IF frequency/IF bandwidth (MHz)	44/6		36/8		
Noise figure (dB)	6 (TYP.)				
Phase noise	-90 dBc/Hz [at 10 kHz offset]		-87 dBc/Hz [at 10 kHz offset]		
Image rejection (dB)	-60 (TYP.)		-55		
Channel selection system	PLL (I ² C-bus)*1				
Power consumption (W)	1.8		2.0	0.75	1.3
Supply voltage (V DC)	1.2, 2.5, 3.3, 5		5	2.5, 3.3, 5	
Outline dimensions (mm)	70.0 x 37.0 x 10.0		70.0 x 36.9 x 12.5	68.2 x 35.9 x 14.1	70.0 x 29.4 x 13.0

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■ Front-End Units for Digital Terrestrial and Analog Terrestrial Broadcasting

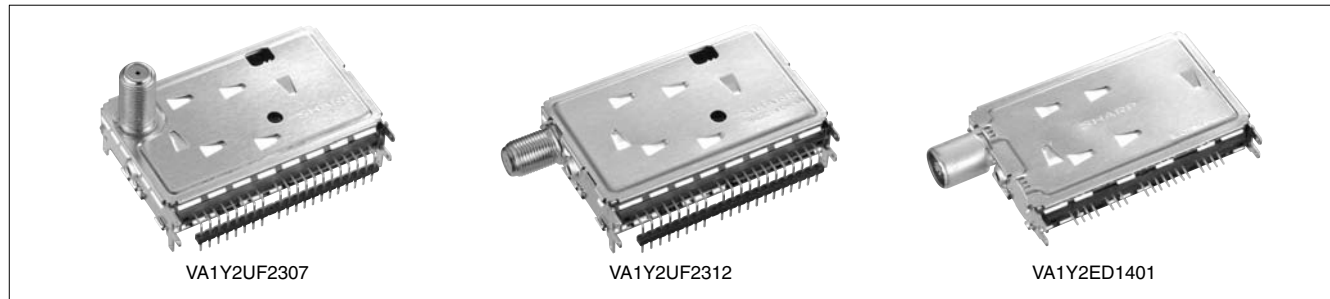
◆ Features

Contributing to the development of thinner LCD TVs and similar products by combining compatibility with digital and analog terrestrial broadcasts into a single unit.

◆ Standard Specifications

Destination	North America <Digital/Analog>				Europe <Digital/Analog>		China/Asia <Analog>				
Model No.	VA1Y2UF2307/VA1Y2UF2312				VA1Y2ED1401		VT2W5CD551				
Input frequency	Low: 54 to 160.9 MHz Mid: 161 to 425.9 MHz High: 426 to 864 MHz				VHF: 47 to 430 MHz UHF: 430 to 862 MHz		47 to 862 MHz				
Analog intermediate frequency (MHz)	Video	45.75				B/G, I, D/K, L: 39.875 L': 33.125		38.0			
	Audio	41.25				D/K, L: 33.375 I: 33.875 B/G: 34.375 L': 39.625		D/K: 31.5, I: 32.0, B/G: 32.5, M/N: 33.5			
Digital intermediate frequency (MHz)	44				36		—				
Digital IF bandwidth (MHz)	6				7/8 (switchable)		—				
Phase noise	-80dBc/Hz (Typ.) at 20kHz offset				-85dBc/Hz (Typ.) at 10kHz offset		—				
Supply voltage (V DC)	3.3, 5.0				5.0, 30		MB: 5/BT: 31				
Noise figure (dB)	6	6	7	7	Typ. 6		6	7	6	6	
Channel selection system	PLL (I ² C-bus)*1										
Image rejection (dB)	VL: 65, VH: 65		60		Typ. 65		VL: 70, VH: 70		55		
Outline dimensions (mm)	65.0 × 40.4 × 12.3				61.5 × 35.0 × 10.9		60.9 × 41.5 × 15.0				

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DIGITAL TERRESTRIAL COMPOUND RECEIVER MODULE



■ Digital Terrestrial Compound Receiver Module

<DU6D3JF40xx Series>

◆ Features

DU6D3JF40xx series receiver modules incorporate a tuner circuit, OFDM demodulator, MPEG decoder circuit, and video encoder in a single package. The basic software for receiving digital terrestrial broadcasts is included, reducing the amount of time required for product development. Low noise radiation makes it easy keep overall product noise emissions low.

◆ Standard Specifications

Destination		Japan
Model No.		DU6D3JF40xx series
Supported broadcast formats		ISDB-T (digital terrestrial), NTSC (analog terrestrial)
Receiving channel (ch) VHF/UHF, CATV		[VHF] 1 to 12, [UHF] 13 to 62, [CATV] C13 to C63
Basic specifications	Reception input frequency	90 to 770 MHz
	MPEG decoder block	MPEG2 MP@ML/MP@HL
Basic specifications	Audio decoder block	MPEG2-AAC
	Video output (ISDB-T)	YPbPr (1080i half decoding)
	(NTSC)	CVBS
	Audio output (ISDB-T)	Stereo analog audio output (L/R)
	(NTSC)	Sound IF output (split-carrier audio receiving system)
Control terminal	I ² C × 1 channel (for communication with main system)	
Functions	CAS	Decryption using serial communication with main system
	EPG	Simple EPG
	Subtitles	Built-in display function
	Setting menu	Built-in setting menu for digital receiver
Supply source		(RF) DC 5 V, (digital) DC 5 V, (OFDM) DC 1.5 V



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■ One-Seg Tuner Module

◆ Features

- (1) High sensitivity: -109 dBm [typ.] (QPSK, CR1/2 ch13)
- (2) Compact and thin design: 7.3 x 7.3 x 1.25 mm
- (3) Low power consumption: 85 mW*1
- (4) Output interface: TS serial output



◆ Standard Specifications

Destination	Japan
Model No.	VA3A5JZ912
Input frequency	470 to 770 MHz (UHF: 13 to 62)
Input signal level	-109 dBm [typ.] (QPSK, CR1/2, ch13)
Supply voltage	2.9 V (RF) 1.5 V (OFDM Core) 1.8 V to 2.9 V (I/O)
Power consumption	85 mW*1/100 mW (When current consumption control is turned off.)
Operating temperature	-20 to 85°C
Control I/F	I ² C-bus*2
Power off function	OFF for RF/OFDM power supply, 2 μA (MAX.) for I/O power supply (ON state)

*1 Average value when current consumption is controlled by software

*2 I²C-bus is a trademark of Philips Corporation.

■ One-Seg/Three-Seg Tuner Module

◆ Features

- (1) High sensitivity: -109 dBm [typ.] (QPSK, CR1/2 ch15)
-110 dBm [typ.] (QPSK, CR1/2 ch7)
- (2) Compact and thin design: 9.0 x 9.0 x 1.5 mm
- (3) Low power consumption: 125 mW (at three-seg), 120 mW (at one-seg)
- (4) Output interface: TS serial output



◆ Standard Specifications

Destination	Japan
Model No.	VA35JZ9904
Input frequency	188 to 198 MHz (UHF: 7, 8) 470 to 770 MHz (UHF: 13 to 62)
Input signal level	-109 dBm [typ.] (QPSK, CR1/2, ch7) -110 dBm [typ.] (QPSK, CR1/2, ch15)
Supply voltage	1.8 V (RF) 1.2 V (OFDM Core) 1.8 V to 2.8 V (I/O)
Power consumption	125 mW (at three-seg), 120 mW (at one-seg)
Operating temperature	-20 to 85°C
Control I/F	I ² C-bus*1
Power off function	All power supplies can be OFF.

*1 I²C-bus is a trademark of Philips Corporation.

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EMBEDDED WIRELESS LAN MODULE

★Under development



■ Embedded Wireless LAN Module

◆ Features

- (1) LSI implementation of MAC functionality for reduced load on host CPU and high throughput
Transmission: 8.0 Mbps
Reception: 10.7 Mbps
Test environment: Xscale platform + SDIO I/F base (PXA270 + 520 MHz clock)
- (2) Low power consumption
Continuous transmission: 530 mW (11g: +10 dBm output)
Continuous reception: 326 mW
Sleep mode: 81 μ W
- (3) Wake on WLAN support
- (4) LSI implementation of encryption function for reduced load on host CPU



◆ Standard Specifications

Standard	IEEE802.11b/g
Model No.	★DC2J1DZ150
Operating frequency	2 400 to 2 484 MHz
Data rate	1/2/5.5/11 & 6/9/12/18/24/36/48/54 Mbps
Number of channels	13
Demodulator system	CCK/DQPSK/DBPSK (11b) OFDM (11g)
Transmission output	+13 dBm / +10 dBm
Reception sensitivity	Typ.: -85 dBm (11 Mbps CCK) Typ.: -70 dBm (54 Mbps OFDM)
Channel selection system	PLL (I ² C)
Security	WEP TKIP AES
Outline dimensions (mm)	7.9 × 8.5 × 1.4

Driver software consults separately.

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■ Infrared Data Communication Device Lineup

Communication system	Transmission speed	Transmission distance	Features	Operating supply voltage	Model No.		
IrDA data (IrDA 1.x)	FIR 4 Mb/s	100 cm	Compact, thin (height: 2.5 mm), low voltage operation type, LP/HP mode switching function	2.4 to 3.6 V	GP2W1004YP0F		
			Compact	2.7 to 5.5 V	GP2W1001YP0F		
		70 cm	LP/HP mode switching function	2.4 to 3.6 V	GP2W1010YP0F		
		50/20 cm	LP/HP mode switching and remote control transmission functions	2.4 to 3.6 V	GP2W3120YP0F		
		50/20 cm	LP/HP mode switching function	2.7 to 3.6 V	GP2W1320YP0F		
		70/20 cm	LP/MP/HP mode switching and remote control transmission functions	2.6 to 3.3 V	GP2W3104YP0F		
		MIR 1.152 Mb/s	100 cm	Compact, low dissipation current	2.4 to 3.6 V	GP2W1002YP0F	
		70 cm			2.4 to 3.6 V	GP2W1302YP0F	
			50 cm		2.4 to 3.6 V	GP2W1304YP	
		SIR 115.2 kb/s	100 cm	Compact, low dissipation current	2.4 to 5.5 V	GP2W0004YP0F/ GP2W0004XP0F	
		80 cm		Remote control transmission function, compact, low dissipation current	2.4 to 5.5 V	GP2W3020YP	
				Built-in LED constant current circuit, 3-state output	2.0 to 3.6 V	GP2W0110VX/ GP2W0110VY	
		SIR LP 115.2 kb/s	20 cm	Remote control transmission function (built-in drive circuit) λp: 890 nm	(Height: 1.5 mm)	2.4 to 3.6 V	GP2W0150YP0F
					(Height: 2.1 mm) Top view type	2.4 to 3.6 V	GP2W0150XP0F
					(Height: 1.5 mm)	2.4 to 3.6 V	GP2W3250YP
Top view type	2.4 to 3.6 V				GP2W3270YP0F/ GP2W3270XP0F		

■ Infrared Wireless Audio Transmission Device Lineup

Communication system	Features	Operating supply voltage	Model No.
Infrared system (1-bit audio transmission)	For designing compact, low-power-consumption audio transmission systems	2.4 to 3.6 V	GP2WVR01YP0F/ GP2WVC01MP0F (Transmission LSI)

INFRARED DATA COMMUNICATION DEVICES

☆New product



■ Infrared Data Communication Devices

◆ FIR Compliant Devices

Model No.	Communication system	Transmission rate	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W3120YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	With remote control transmission function, LP/HP mode switching function	50/20*1	2.4 to 3.6	7.16 × 2.73 × 1.82
GP2W1010YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	LP/HP mode switching function	70	2.4 to 3.6	7.9 × 2.85 × 2.15
☆GP2W1004YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	LP/HP mode switching function	100	2.4 to 3.6	7.9 × 2.85 × 2.5
GP2W1001YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	—	100	2.7 to 5.5	10.01 × 4.4 × 3.5
GP2W1320YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	Compact, thin, low dissipation current during shutdown (lcc: TYP. 0.45 mA)	50/20*1	2.7 to 3.6	7.16 × 2.73 × 1.82
GP2W3104YP0F	Bi-directional (half-duplex) communication	9.6 k to 4 Mb/s	Compact, thin, with remote control transmission function, LP/MP/HP mode switching function	70/20*2	2.6 to 3.3	7.9 × 2.85 × 2.5

*1 MIN. 20 cm at 150 mA MIN. 50 cm at 250 mA

*2 MIN. 21 cm at 150 mA MIN. 70 cm at 450 mA



◆ MIR Compliant Devices

Model No.	Communication system	Transmission rate	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W1002YP0F	Bi-directional (half-duplex) communication	9.6 k to 1.152 Mb/s		100	2.4 to 3.6	8.0 × 3.0 × 2.5
GP2W1302YP0F	Bi-directional (half-duplex) communication	9.6 k to 1.152 Mb/s	Compact, compatible with 2.15 mm height for mobile phone	70	2.4 to 3.6	7.9 × 2.85 × 2.15
GP2W1304YP	Bi-directional (half-duplex) communication	9.6 k to 1.152 Mb/s	Compact, compatible with 1.82 mm height for mobile phone	50	2.4 to 3.6	7.16 × 2.73 × 1.82



◆ SIR Compliant Front-Ends

Model No.	Communication system	Transmission rate	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W0004YP0F	Bi-directional (half-duplex) communication	9.6 k to 115.2 kb/s	Low dissipation current (lcc: 130 μA MAX.)	100	2.4 to 5.5	9.21 × 3.76 × 2.71
GP2W0004XP0F	Bi-directional (half-duplex) communication	9.6 k to 115.2 kb/s	Low dissipation current (lcc: 130 μA MAX.)	100	2.4 to 5.5	9.2 × 3.35 × 2.95
GP2W3020YP	Bi-directional (half-duplex) communication	9.6 k to 115.2 kb/s	With remote control transmission function (Transmission distance TYP. 7 m, I _F = 350 mA) Low dissipation current during shutdown (lcc: 130 μA MAX.)	80	2.4 to 5.5	7.9 × 2.85 × 2.15



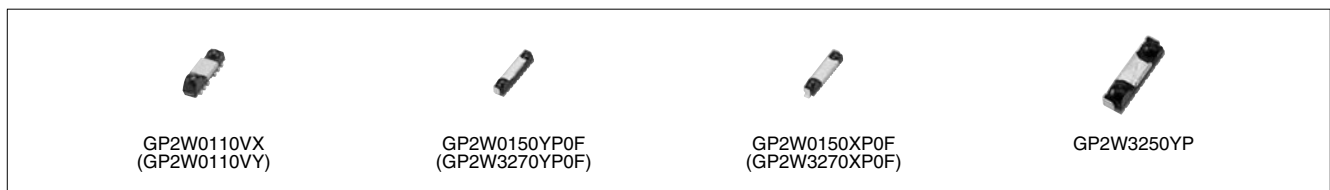
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◆SIR LP Compliant Front-Ends

Model No.	Communication system	Transmission rate	Description	Transmission distance (cm)	Supply voltage (V DC)	Outline dimensions (mm)
GP2W0110VX/VY	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Top-view and side view compatible (Model name is prescribed based on the packaging status.), lead-free type available	20	2.0 to 3.6	6.8 × 2.35 × 2.1
GP2W0150YP0F	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Compact, thin, low dissipation current (I _{cc} : 100 μA MAX.)	20	2.4 to 3.6	7.6 × 2.4 × 1.5
GP2W0150XP0F	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Compact, thin, low dissipation current (I _{cc} : 100 μA MAX.) Top view type	20	2.4 to 3.6	8.3 × 2.1 × 1.7
GP2W3250YP	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Remote control transmission function, shared IR communication section (λ _p = 890 nm)	20	2.4 to 3.6	7.2 × 2.55 × 1.85
GP2W3270YP0F	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Remote control transmission function, shared IR communication section (λ _p = 890 nm)	20	2.4 to 3.6	7.6 × 2.4 × 1.5
GP2W3270XP0F	Bi-directional (half-duplex) communication	2.4 k to 115.2 kb/s	Remote control transmission function, shared IR communication section (λ _p = 890 nm) Top view type	20	2.4 to 3.6	8.3 × 2.1 × 1.7



■ Infrared Wireless Audio Transmission Device

Model No.	Communication system	Features	S/N ratio	Supply voltage (V DC)	Outline dimensions (mm)
GP2WVR01YP0F (Reception Device)	1-bit audio transmission (1.5 MHz)	Compact, low power consumption type Simple circuit configuration: Used in combination with transmission LSI (GP2WVC01MP0F) and transmission device (GP2W1004YP0F, etc.)	70 dB	2.4 to 3.6	2.5 × 8 × 3



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IR Detecting Unit for Remote Control Lineup

Type	Package		Features	Model No.		
	Form	Detection position*5 (from PCB)		Operating voltage: 3 V	Operating voltage: 5 V	Operating voltage: 3 to 5 V
IR detecting unit for remote control	Lead L bend with holder	16.0 mm*1	Compact size	GP1UE28XK0VF series	GP1UM28XK0VF series	GP1UE28xXKC1 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE28RK0VF series	GP1UM28RK0VF series	GP1UE28xRKC1 series
		12.0 mm*2	Low dissipation current			GP1UD28XK00F series
			Compact size	GP1UE27XK0VF series	GP1UM27XK0VF series	GP1UE27xXKC1 series
		6.8 mm*3	Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE27RK0VF series	GP1UM27RK0VF series	GP1UE27xRKC1 series
			Low dissipation current			GP1UD27XK00F series
		19.0 mm	Compact size	GP1UE26XK0VF series	GP1UM26XK0VF series	GP1UE26xXKC1 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE26RK0VF series	GP1UM26RK0VF series	GP1UE26xRKC1 series
		9.6 mm	Low dissipation current			GP1UD26XK00F series
			Compact size	GP1UE29QK0VF series	GP1UM29QK0VF series	GP1UE29xQKC1 series
		9.6 mm	Compact size	GP1UE28YK0VF series	GP1UM28YK0VF series	GP1UE28xYKC1 series
			Compact size, Strengthened resistance to electromagnetic induction noise (Mesh type)	GP1UE28QK0VF series	GP1UM28QK0VF series	GP1UE28xQKC1 series
			Low dissipation current			GP1UD28YK00F series
			Compact, thin type SMD (4.1 × 3.84 × 0.95 t mm)			GP1US30XP series
			Compact type SMD (6.8 × 2.1 × 2.35 t mm)			GP1UF31 series
	Holderless	Lead straight 6.0 mm		GP1UX31QS series	GP1UX51QS series	GP1UXC1xQS series
		Lead L bend*4 5.3 mm		GP1UX31RK series	GP1UX51RK series	GP1UXC1xRK series

*1 Mesh type (strengthened resistance to electromagnetic induction noise): 16.4 mm

*2 Mesh type: 12.4 mm

*3 Mesh type: 7.2 mm

*4 Mesh type: 5.3 mm

*5 Lead straight: Distance from lens center to mounting board upper surface

No mesh lead L bend: Distance from tip of lens to mounting board upper surface

Mesh-type lead L bend: Distance from tip of mesh to mounting board upper surface

■ IR Detecting Units for Remote Control (1)

(Ta = 25°C)

Series No.	Absolute maximum ratings		Electrical characteristics				Size (mm)	Remarks
	Vcc (V)	To _{pr} (°C)	I _{cc} (mA) MAX. ^{*1}	V _{OH} (V) MIN.	V _{OL} (V) MAX.	f _o (kHz) TYP.		
☆GP1UE26xXKC1* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 6.8	* ⁵ , CMOS type
☆GP1UE27xXKC1* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 12.0	* ⁵ , CMOS type
☆GP1UE28xXKC1* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 16.0	* ⁵ , CMOS type
☆GP1UE28xYKC1* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 8.6 × 12.5(9.6)* ²	* ⁵ , CMOS type
☆GP1UE26xRKC1* ^{4, 8}	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 7.2	* ⁵ , CMOS type
☆GP1UE27xRKC1* ^{4, 8}	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 12.4	* ⁵ , CMOS type
☆GP1UE28xRKC1* ^{4, 8}	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 16.4	* ⁵ , CMOS type
☆GP1UE28xQKC1* ^{4, 8}	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.0 × 12.5(9.6)* ²	* ⁵ , CMOS type
☆GP1UE29xQKC1* ^{4, 8}	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 16.2 × 21.9(19)* ²	* ⁵ , CMOS type
GP1UM26XK0VF* ¹²	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹⁰	0.45* ¹⁰	40* ³	5.6 × 9.6 × 6.8	* ⁵
GP1UM27XK0VF* ¹²	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹⁰	0.45* ¹⁰	40* ³	5.6 × 9.6 × 12.0	* ⁵
GP1UM28XK0VF* ¹²	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹⁰	0.45* ¹⁰	40* ³	5.6 × 9.6 × 16.0	* ⁵
GP1UM28YK0VF* ¹²	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹⁰	0.45* ¹⁰	40* ³	5.6 × 8.6 × 12.5(9.6)* ²	* ⁵
GP1UM26RK0VF* ^{4, 12}	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ³	5.6 × 9.6 × 7.2	* ⁵
GP1UM27RK0VF* ^{4, 12}	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ³	5.6 × 9.6 × 12.4	* ⁵
GP1UM28RK0VF* ^{4, 12}	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ³	5.6 × 9.6 × 16.4	* ⁵
GP1UM28QK0VF* ^{4, 12}	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ³	5.6 × 9.0 × 12.5(9.6)* ²	* ⁵
GP1UM29QK0VF* ^{4, 12}	0 to 6.0	-10 to +70	0.6 (0.65)* ¹⁸	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ³	5.6 × 16.2 × 21.9(19)* ²	* ⁵
GP1UE26XK0VF* ⁸	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 6.8	* ⁵
GP1UE27XK0VF* ⁸	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 12.0	* ⁵
GP1UE28XK0VF* ⁸	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 9.6 × 16.0	* ⁵
GP1UE28YK0VF* ⁸	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ⁹	0.45* ⁹	40* ¹⁶	5.6 × 8.6 × 12.5(9.6)* ²	* ⁵
GP1UE26RK0VF* ^{4, 8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 7.2	* ⁵
GP1UE27RK0VF* ^{4, 8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 12.4	* ⁵
GP1UE28RK0VF* ^{4, 8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.6 × 16.4	* ⁵
GP1UE28QK0VF* ^{4, 8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 9.0 × 12.5(9.6)* ²	* ⁵
GP1UE29QK0VF* ^{4, 8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.6 × 16.2 × 21.9(19)* ²	* ⁵
GP1UD26XK00F* ⁸	0 to 6.0	-10 to +70	0.2 (V _{cc} = 3 V)	V _{cc} -0.5* ⁹	0.5* ⁹	40* ³	7.3 × 13.1 × 6.8	* ⁵
GP1UD27XK00F* ⁸	0 to 6.0	-10 to +70	0.2 (V _{cc} = 3 V)	V _{cc} -0.5* ⁹	0.5* ⁹	40* ³	7.3 × 13.1 × 12.0	* ⁵
GP1UD28XK00F* ⁸	0 to 6.0	-10 to +70	0.2 (V _{cc} = 3 V)	V _{cc} -0.5* ⁹	0.5* ⁹	40* ³	7.3 × 13.1 × 16.0	* ⁵
GP1UD28YK00F* ⁸	0 to 6.0	-10 to +70	0.2 (V _{cc} = 3 V)	V _{cc} -0.5* ⁹	0.5* ⁹	40* ³	7.3 × 8.4 × 13.0(9.6)* ²	* ⁵
☆GP1UXC1xQS* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.5 × 5.3 × 7.5	* ⁵ , CMOS type, Pin configuration (Pin No. 2: GND)
☆GP1UXC1xRK* ⁸	0 to 6.0	-10 to +70	0.5	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ¹⁶	5.5 × 5.3 × 7.5	* ⁵ , CMOS type, Pin configuration (Pin No. 2: GND), Folded lead
GP1UX51QS* ¹³	0 to 6.0	-10 to +70	0.6	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ¹⁵	5.5 × 5.3 × 7.5	* ⁵ , Pin configuration (Pin No. 2: GND)
GP1UX51RK* ¹³	0 to 6.0	-10 to +70	0.6	V _{cc} -0.5* ¹¹	0.45* ¹¹	40* ¹⁵	5.5 × 5.3 × 7.5	* ⁵ , Pin configuration (Pin No. 2: GND), Folded lead
GP1UX31QS* ⁸	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5* ¹⁴	0.45* ¹⁴	40* ⁷	5.5 × 5.3 × 7.5	* ⁵ , Pin configuration (Pin No. 2: GND)

* For footnotes, see the next page.

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IR DETECTING UNIT FOR REMOTE CONTROL

☆New product



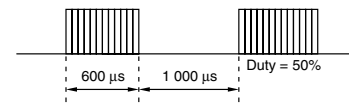
IR Detecting Units for Remote Control (2)

(Ta = 25°C)

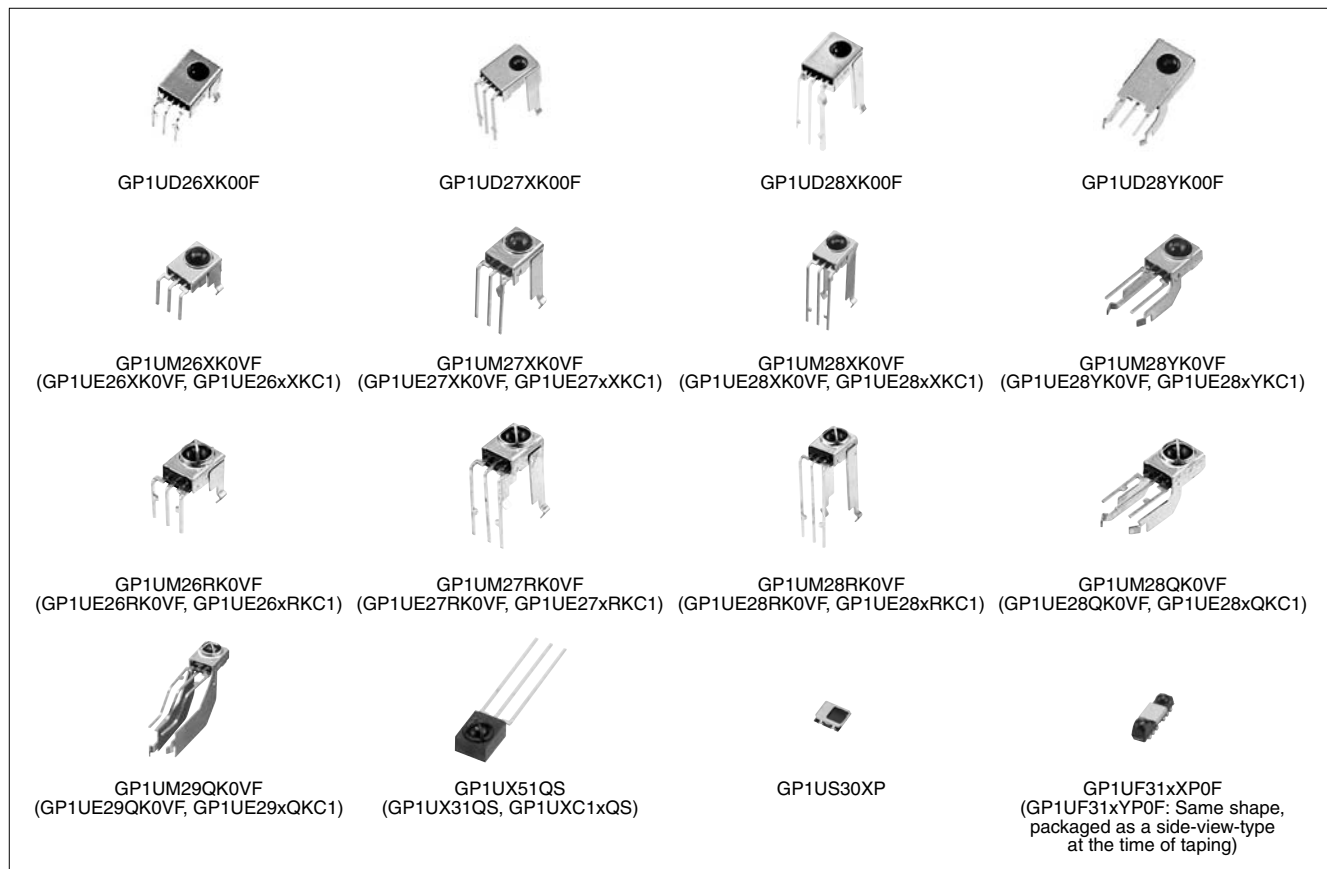
Series No.	Absolute maximum ratings		Electrical characteristics				Size (mm)	Remarks
	Vcc (V)	To _{pr} (°C)	I _{cc} (mA) ^{*1} MAX.	V _{OH} (V) MIN.	V _{OL} (V) MAX.	f _o (kHz) TYP.		
GP1UX31RK ^{*8}	0 to 6.0	-10 to +70	0.4	V _{cc} -0.5 ^{*14}	0.45 ^{*14}	40 ^{*7}	5.5 × 5.3 × 7.5	^{*5} , Pin configuration (Pin No. 2: GND), Folded lead
GP1US30XP ^{*6, 17}	0 to 6.0	-30 to +85	0.6	V _{cc} -0.5 ^{*19}	0.45 ^{*19}	40 ^{*7}	4.1 × 3.95 × 0.95	^{*5} , Surface mount compatible
☆GP1UF31xXP0F ^{*8}	0 to 6.0	-30 to +85	0.4	V _{cc} -0.5 ^{*19}	0.45 ^{*19}	40 ^{*7}	6.8 × 2.1 × 2.35	^{*5} , Surface mount compatible
☆GP1UF31xYP0F ^{*8}	0 to 6.0	-30 to +85	0.4	V _{cc} -0.5 ^{*19}	0.45 ^{*19}	40 ^{*7}	6.8 × 2.1 × 2.35	^{*5} , Surface mount compatible

- *1 When no signal is input (during input light).
- *2 Figures in parentheses indicate the distance to the light detection center.
- *3 In addition to the fo = 40kHz type, types fo = 36, 38, 36.7, 56.8, and 32.75 kHz are also available.
- *4 Type with strengthened resistance to electromagnetic induction noise.
- *5 A voltage regulator circuit is built-in but may be affected by the usage environment. Install with an externally mounted C and R as a power supply filter.
- *6 Allows reflow soldering.
- *7 In addition to the fo = 40 kHz type, types fo = 36, 38, and 36.7 kHz are also available.
- *8 Operating voltage: 2.7 to 5.5 V
- *9 Distance to transmitter on optical axis is 0.2 to 10.0 m. Ev < 10 lx when burst wave is input as shown in the right figure.
- *10 Distance to transmitter on optical axis is 0.2 to 10.5 m. Ev < 10 lx when burst wave is input as shown in the right figure. (fo = 56.8 kHz: 0.2 to 9.0 m)
- *11 Distance to transmitter on optical axis is 0.2 to 8.5 m. Ev < 10 lx when burst wave is input as shown in the right figure. (fo = 56.8 kHz: 0.2 to 7.0 m, fo = 32.75 kHz: 0.2 to 6.5 m)
- *12 GP1UM series operating voltage: 4.5 to 5.5 V
- *13 Operating voltage: 4.5 to 5.5 V
- *14 Distance to transmitter on optical axis is 0.2 to 8.0 m. Ev < 10 lx when burst wave is input as shown in the right figure.
- *15 Distance to transmitter on optical axis is 0.2 to 6.5 m. Ev < 10 lx when burst wave is input as shown in the right figure.
- *16 In addition to the fo = 40 kHz type, types fo = 32.75, 36, 36.7, and 38 kHz are also available.
- *17 Operating voltage: 2.4 to 5.5 V
- *18 fo = 56.8 kHz
- *19 Distance to transmitter on optical axis is 0.2 to 5.0 m. Ev < 10 lx when burst wave is input as shown in the right figure.

<Burst wave>



GP1UD series, GP1UM series, GP1UE series have different fo values for each model.



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■ Switching Power Supplies (Custom)

◆ Features

- (1) Satisfies energy saving regulations thanks to the high conversion efficiency
- (2) Compact and high reliability thanks to the modulated main switching and chopper circuits
- (3) EMI filter built-in, low noise design
- (4) Environmentally safe types are also available. [RoHS, lead-free]

◆ Specification examples

Applications	LCD TV (20 to 22")	LCD TV (26 to 32")	Laser-beam printer/ Scanner/FAX
Input voltage (V AC)	90 to 110	90 to 264	85 to 138
Input frequency (Hz)	50/60	50/60	50/60
Output voltage (V) (Current capacity)	+24 (1.9 A) +12 (3.5 A)	+24 (5.0 A) +12 (4.0 A) +5 (5.5 A) +5 (1.5 A) +3.3 (3.0 A)	+3.3 (0.25 A) +5 (1.1 A) +12 (0.13 A) +24 (2.0 A)
Rated output power (W)	87.6	213	55.9
Stand-by power loss (W)	0.07 (without load)	0.1	-
Protection circuit	Overcurrent and overvoltage protection		
Configuration	On-board		
Outline dimensions (mm)	118 × 208 × 36	140 × 244 × 35.6	204 × 124 × 40

* Types with input voltage of AC 100 V, 120 V, 200 V are also available. Types with other specification are also available upon request. For LCD TVs (20" to 22"), an integrated power source with an inverter circuit for backlights is also available.

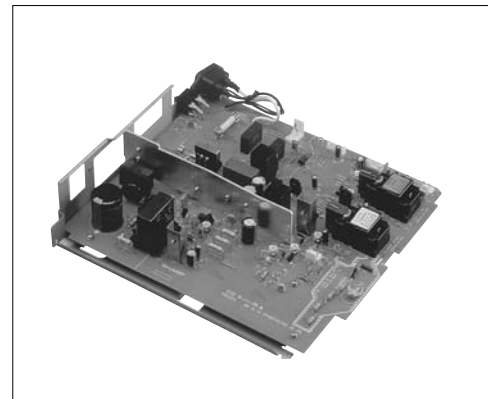
■ Switching Power Supply with Integrated High/Low Voltage Circuit (Custom)

◆ Features

- (1) Realizes compact and low cost thanks to the integrated high/low voltage circuit
- (2) Easy connection between high voltage and low voltage circuits
- (3) Highly efficiency energy saving power supply at standby mode can be installed for low voltage circuit
- (4) Environmentally safe types are also available. [RoHS, lead-free]

◆ Specifications

		Sharp 'Green Power Supply' adapting with integrated high/low voltage circuit regulation
High voltage	Switching power supply system	Pulse width control or RCC method
	Input voltage (V DC)	24
	Output voltage (kV DC)	+5.5 (+280 μA)/-5.5 (-560 μA), etc.
Low voltage	Switching power supply system	Pulse width control or RCC method
	Input voltage (V AC)	100, 120, 230
	Power capacity (W)	184



Notice

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Advanced Flex Printed Circuit Boards

The advanced flex printed circuit board is a multilayered composite wiring board comprised of flexible printed circuits (FPC) laminated into a multilayer configuration. The PWBs and FPCs are connected to each other via copper-plated through holes. It is ideal for compact, light-weight equipment design.

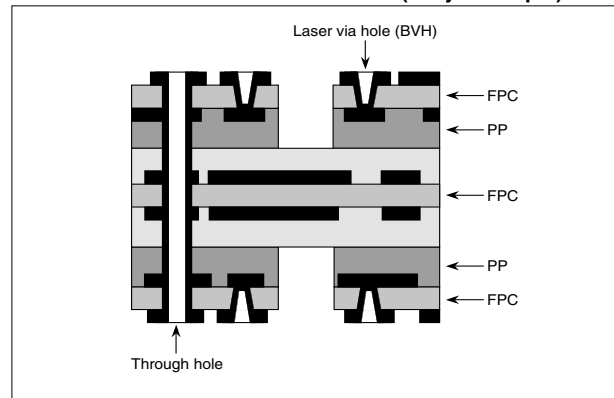
◆ Features

- (1) For selecting optimal specifications to suit specific applications, special specifications such as for mobile phones are available.
 - Minimum thickness in multi-layer part: 0.26 mm (4-layer), 0.33 mm (6-layer)
 - Minimum pattern width/pitch: 0.06/0.07 mm
 - Flexibility of single/double sided FPC part (dedicated for hinge): More than 200 000 times 180-degree bending of radius 3 mm
- (2) Capable of board-to-board connection without connectors, which enables space-saving and 3-dimensional equipment assembly.
- (3) Through hole plating connection of multi-layer (3 to 8) part to flexible part significantly improves reliability.
- (4) Blind Via Hole (BVH) forming with laser via drilling of small diameter.
- (5) Sheet design provides excellent mountability, equivalent to that of PWB.

◆ Outline Specifications

Type	Folding type/Flying tail type	
Min. base thickness	0.26 mm (4-layer), 0.33 mm (6-layer), 0.40 mm (8-layer)	
Min. line width/spacing	0.06/0.07 mm	
Min. through hole diameter	ø0.25 mm	
Min. via hole land diameter	Through hole	Outer layer: ø0.5 mm, Inner layer: ø0.5 mm
	Blind via hole	ø0.09 mm
	Inner via hole	ø0.30 mm
Solder resist	Multi layer: Liquid photo solder resist, FPC: Film cover ray	
Surface finish	Heat-resistant preflux, Ni-Au plating (Ni-Au plating for flying tail)	
Safety standard (UL approval)	94V-0	

Construction of Advanced Flex Board (6-layer sample)



Notice

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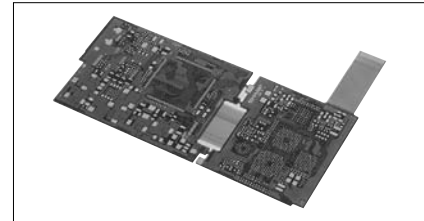
Flexible Build-Up Multilayer PCBs

<Flex-rigid specifications>

Advanced flex specifications are used for the inner layer core material of this build-up multilayer PCB, so the board can handle finer mounting patterns and achieve connectorless between-board connections using an inner layer flexible printed circuit (FPC). This facilitates greater equipment design flexibility and ultra-compact designs.

◆ Features

- (1) Multiple build-up layers are connected internally with an FPC, thereby improving connection reliability between multilayer boards and reducing both connection space and connector weight.
- (2) Enables narrow pitch (0.5 mm) CSP and bare chip mounting, and thus greater equipment compactness through ultra-high density mounting.
- (3) Enables via-on-inner-via-hole configurations, and makes it possible to achieve ultra-high density wiring designs.
(Facilitates a diverse range of designs for greater compactness and thinness.)

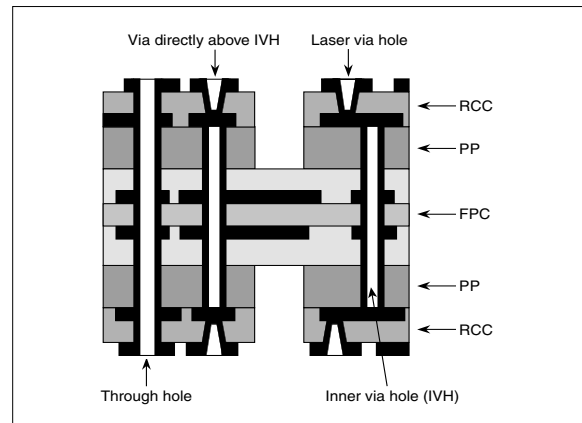


◆ Outline Specifications

Type	F1 (6- to 8-layer)	
No. of build-up layers	1 for each side of core layer	
Core layer configuration	3 to 6 layers (Polyimide, FR-4)	
Min. board thickness*1	0.8 mm (6-layer), 0.87 mm (8-layer)	
Via hole diameter	Conformal via hole	ø0.09 mm/ø0.30 mm
Land hole diameter	Stacked via hole	-
Via-on inner via hole	Available	
Inner via hole diameter	ø0.2 mm	
Min. line width/spacing*2	0.09 mm/0.09 mm	
CSP mountable pitch	0.5 mm	
Safety standard	UL (94V-0)	

*1 Consult with SHARP if a thinner type is required for special designs.

*2 Values are measured at build-up portion.



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Flexible Printed Circuit Boards

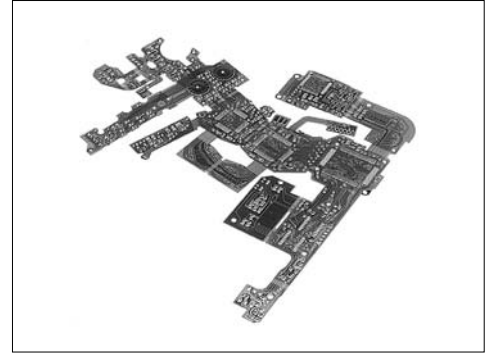
The flexible printed circuit board is designed for high space efficiency and product design flexibility, which are now aiming at more compact and higher density mounting. It also contributes to the reduction of assembly process and to the enhancement of the reliability.

◆ Features

- (1) High density mounting circuit, SMT and other most suitable flexible PCB are available.
- (2) High precision type for COF with flip chip mounting and wire bonding capabilities and other connector mounting type are available.

◆ Standard specifications

Number of layers	One side	Both-side through-hole
Substrate materials	Polyimido film, non-adhesive polyimido	
Design pattern width	0.02 mm (MIN.)	0.05 mm (MIN.)
Design pattern spacing	0.04 mm (MIN.)	0.05 mm (MIN.)
Through-hole / land diameter	–	ø0.1 mm / ø0.3 mm (MIN.)
Cover lay	Polyimido film, heat resistant ink, liquid soldering resist	
Safety standard	UL (94V-0)	



◆ Line-up

Multi-layer flexible PCB
Single-layer flexible PCB
Single-side high precision flexible PCB

Both-side flexible PCB
Flex-rigid PCB
Both-side high precision flexible PCB

Other line-up

Bonding Ni-Au plating
Highly flexible (bending capacity)
High density SMT

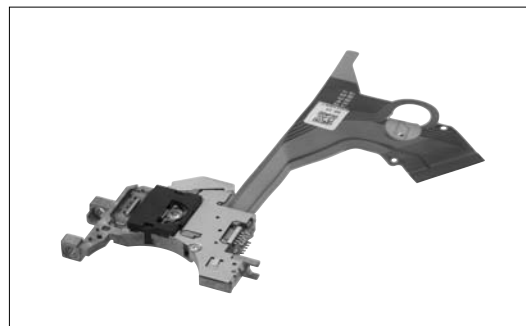
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■ Slim Combo Drive Pickup <DD-56>

◆ Features

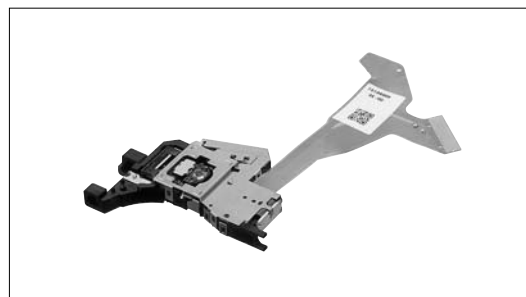
- Thin type pickup compatible with half-inch-height drive (12.7 mm thickness)
- Playback speed: ×8 (DVD-ROM), ×24 (CD-ROM)
- Recording speed: ×24 (CD-R), ×24 (CD-RW)
- DVD-RAM readable
- Outline dimensions: W 38.6 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 15 g



■ Slim DVD-ROM Drive Pickup <DD-30>

◆ Features

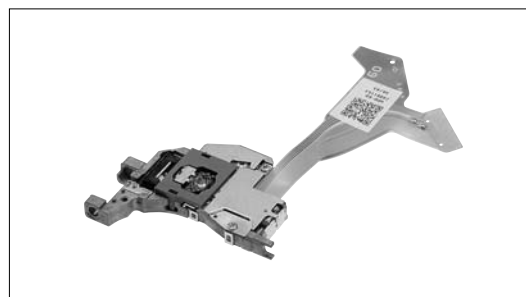
- Thin type pickup compatible with half-inch-height drive (12.7 mm thickness)
- Playable disk: DVD-ROM/RAM, CD-ROM
- Playback speed: ×8 (DVD-ROM), ×24 (CD-ROM)
- Outline dimensions: W 38.7 × H 7.3 × D 48.7 (mm)
- Weight: Approx. 8 g



■ DVD Pickup for Automotive Use <HPD-66>

◆ Features

- Compact, thin (7.3 mm) pickup
- Playable disk: DVD-ROM, CD-ROM
- Operating temperature: -30 to +85°C
- Outline dimensions: W 30.2 × H 7.3 × D 48.7 (mm)



Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

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PT380F	100
PT381	100
PT381F	100
PT4800E0000F	100
PT4800FE000F	100
PT480E00000F	100
PT480FE0000F	100
PT4810E0000F	100
PT4810FJE00F	100
PT481E0000F	100
PT481FE0000F	100
PT483F1E000F	100
PT4850FE000F	100
PT491FE0000F	100
PT493FE0000F	100
PT501	100
PT510	100
PT550	100
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PT600T	100
PT601T	100

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RJ2311BA0PB	18/23/24/25/26
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RJ2321BA0PB	18/23/24/25/26
RJ2351AA0BB	18/23/24/25/26
RJ2351BA0AB	18/23/24/25/26
RJ2361AA0BB	18/23/24/25/26
RJ2361BA0AB	18/23/24/25/26
RJ23S3BE0BT	18/22
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RJ23T3CC0BT	18/22
RJ23U3BC0BT	18/22
RJ23U3CC0BT	18/22
RJ23U3EA0KT	18/22
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RJ23V3BA0BT	18/22
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RJ23V3EA0KT	18/22
RJ23V3FA0KT	18/22
RJ23W3BA0KT	18/22
RJ23W3CA0KT	18/22
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RJ2411AB0PB	19/23/24/25/26
RJ2411BA0PB	19/23/24
RJ2411BB0PB	19/23/24/25/26
RJ2411CA0PB	19/23
RJ2421AB0PB	19/23/24/25/26
RJ2421BB0PB	19/23/24/25/26
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RJ2451BA0PB	19/23/24/25/26
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Large-Scale IC Group (Fukuyama)	EC99J2016	September 24, 1996
Nara Plant	EC99J2021	September 24, 1996
Advanced Development and Planning Center	EC99J2038	December 3, 1996
Mie Factory	EC99J2051	January 28, 1997
Kameyama Plant	EC04J0284	October 12, 2004
Communication Systems Group Hiroshima Plant	JQA-EM5312	April 14, 2006
Appliance Systems Group	JQA-EM5554	November 10, 2006
Audio-Visual Systems Group Tochigi Plant	JQA-EM0339	February 26, 1999



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AVC Liquid Crystal Display Group	JQA-QMA11778
Large-Scale IC Group	JQA-QM8688



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Applicable standards: ISO 9001:2000 and JIS Q 9001:2000
Certifying organization: Reliability Center for Electronic Components of Japan (RCJ)

Division	Certificate No.
Opto-Analog Devices Division	RCJ-94M-23J



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SHARP CORPORATION
A7887 ISO 9001: 2000
Certifying organization: UL, Inc. [JAB, ANAB certified]

Division	Certificate No.
Compound Semiconductor Systems Division	A7887



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A16616 ISO 14001: 2004
Certifying organization: UL, Inc. [UKAS, ANAB certified]

Facility	Certificate No.
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